Chapter 1 INTRODUCTION TO GEOMETRY

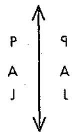
Pages 7–8 (Section 1.1)

1 $\overrightarrow{AB}, \overrightarrow{BA}$, line ℓ 2 $\angle CED, \angle DEC, \angle E, \angle 7$ 3 No

4 $\overline{ES}, \overline{ST}, \overline{TB}$ 5 a B **b** $\overleftrightarrow{AC}$ or $\angle CEA$ **c** E **d** $\varnothing$ **e** $\overrightarrow{EC}$

f $\angle ABC$ **g** $\triangle BEC$ 6 a $\angle RPO, \angle RPS, \angle SPR$ **b** 0 **c** 3

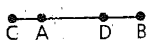
d $\angle TSO, \angle PST, \angle OST$ e 8

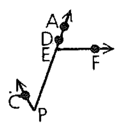
7 

8 a points **b** rays, endpoint 9 J

10 a $A = \ell w = (2.5)(8.6) = 21.5$ sq cm **b** $P = 2\ell + 2w = 2(2.5) + 2(8.6) = 22.2$ cm

11 a $\overline{HK} = \overline{HJ} = 15, \overline{JK} = \frac{1}{2}(15)$; $P = 15 + 15 + 7\frac{1}{2}$; $P = 37\frac{1}{2}$ **b** $P = 4x + 3x + 2x$; $63 = 9x$; $7 = x,\ 4x = 28$

12 

13 

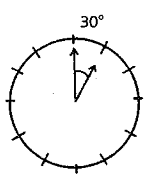
14 a All $\triangle$s are $\triangle EXA, \triangle EXC, \triangle AXC, \triangle TCX, \triangle TAC, \triangle XET, \triangle EAT, \triangle CTE$; $\frac{3}{8} = 37.5\%$ **b** $\frac{2}{8} = 25\%$

Pages 14–17 (Section 1.2)

1 a $61°\ 40'$ **b** $71°\ 42'$ 2 a $132\frac{1}{2}°$ **b** $19\frac{3}{4}°$

3 $\angle 1$ and $\angle 2$ 4 a T **b** $\overrightarrow{VW}$ **c** $\overleftrightarrow{PR}$ **d** $\angle QSR$ e 6

5 a $87°\ 10''$ **b** $82°\ 49'$ 6 a right angle = 90°, $90° - 60° = 30°$ **b** $90° - 70° = 20°$ **c** $180° - 50° = 130°$ **d** obtuse 7 a $\angle 5$ **b** same size **c** $\angle 4$ 8 $(x + 10)° = 60°$ so $x = 50°$, $x + 5° = 55°$

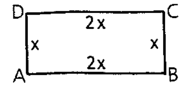
9 

We know this because $12 \times 30° = 360°$ and there are 360° in a circle
a 90° **b** 45° **c** 100° **d** $142\frac{1}{2}°$

10 a 5 **b** PQ = 5, QR = 4 **c** 8

11 $90° - 37°\ 66'\ 10'' = 51°\ 53'\ 50''$

12 a 8 **b** 2 **c** 10 **d** 4 e $\angle AEC, \angle BED$

13 

$2x + 2(2x) = 66$
$6x = 66, x = 11, 2x = 22$

14 $2r + 5 = 3\frac{1}{2}r + 2$; $5 = 1\frac{1}{2}r + 2$; $3 = 1\frac{1}{2}r$; $r = 2$ $3m + 7 = 4.2m + 5$; $7 = 1.2m + 5$; $2 = 1.2m$; $m = \frac{5}{3}$

15 $y = x + 17$ 16 $x = m\angle COA$, $3x = m\angle POC$ then $x + 3x = 90$, $x = 22\frac{1}{3}$, $m\angle POC = 67\frac{1}{2}$

17 a $0 < m\angle P < 90$ **b** $20 < x < 50$ 18 a 3 **b** 4

19 $\frac{3x}{2} + 2 = 2x - 29\frac{1}{4}$; $-\frac{1}{2}x = -31\frac{1}{4}$; $x = 62\frac{1}{2}$
$m\angle ABC$ and $m\angle CBD = 95\frac{3}{4}$, no

20 $\frac{2}{9}(60) = \frac{120}{9} = 13\frac{1}{3}$; $\frac{1}{3}(60) = 20$
$15°\ 13'\ 20''$

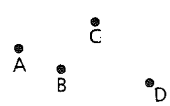
21 $-2(3x + 3y = 90)$; $3(2x + 5y = 180)$ $-6x - 6y = -180$; $\underline{6x + 15y = 540}$; $9y = 360$; $y = 40$; $x = -10$

22 * = XLr8r # = YBcaws
3* + 2# = 90 3* + 2# = 90
3* + 1# = 60 $\underline{-3^* - 1\# = -60}$
\# = 30
3* or 3XLr8r = 30, XLr8r = 10°

23 $72 + \frac{22}{60} + \frac{30}{3600} = 72 + \frac{44}{120} + \frac{1}{120} = 72\frac{45}{120}$ or $72\frac{3}{8}°$

Pages 20–22 (Section 1.3)

1 $3x + 8 + x + 4 = 180°$, $m\angle ABC = 134$

2 

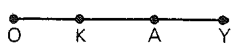
3 a B, D **b** no, yes **c** $\overline{AB}, \overline{BC}$ **d** yes e not necessarily **f** B **g** G **h** $\overline{AF}$ **i** $\overline{EB}, \overline{ED}$ **j** E, B

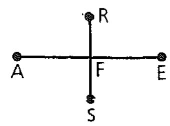
4 a no; right angles cannot be assumed unless they are marked. **b** yes; collinearity of points can be assumed from a diagram.

5 

7

6 $3x + 2x = 90$, $5x = 90$, $x = 18$, $3x = 54$ **7** Possible answers: **a** 33° and 40° **b** 60° and 70° **c** 45° and 45° **8 a** 124°36' **b** $84\frac{5}{6}°$ **9** $3x + x = 180$, $4x = 180$, $x = 45$, $3x = 135°$

10 

11 

12 B **13 a** 15 **b** 3 **14 a** $-8 < Q < 4$ **b** $PQ + QR = PR = 12$

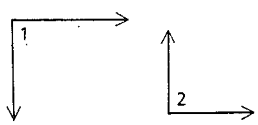
15

$$
\begin{array}{rcl@{\qquad}rcl}
(2x + 40) + (2y + 40) & = & 180 & 2(20) + 2y & = & 100 \\
(x + 2y) + (2y + 40) & = & 180 & 40 + 2y & = & 100 \\
2x + 2y & = & 100 & 2y & = & 60 \\
x + 4y & = & 140 & y & = & 30 \\
-4x - 4y & = & -200 & m\angle 1 & = & 80 \\
\underline{x + 4y} & = & \underline{140} & m\angle 2 & = & 100 \\
-3x & = & -60 & m\angle 3 & = & 80 \\
x & = & 20 & & &
\end{array}
$$

16 11:10 AM **17** ≈1:05' 27"

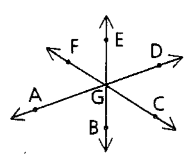
Pages 26–27 (Section 1.4)

1 Given: ∠1 is a rt∠.
∠2 is a rt∠.
Prove: ∠1 ≅ ∠2



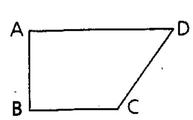
1 ∠1 is a rt∠.	1 Given
2 ∠2 is a rt∠.	2 Given
3 ∠1 ≅ ∠2	3 If two ∠s are rt∠s, then they are ≅.

2 Given: Diagram as shown
Prove: ∠AGD ≅ ∠EGB



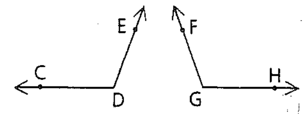
1 Diagram as shown	1 Given
2 ∠AGD is a st∠.	2 Assumed from diagram
3 ∠EGB is a st∠.	3 Assumed from diagram
4 ∠AGD ≅ ∠EGB	4 If two ∠s are st∠s, then they are ≅.

3 Given: ∠A is a rt∠.
∠B is a rt∠.
Prove: ∠A ≅ ∠B



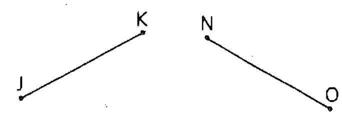
1 ∠A is a rt∠.	1 Given
2 ∠B is a rt∠.	2 Given
3 ∠A ≅ ∠B	3 If two ∠s are rt∠s, then they are ≅.

4 Given: ∠CDE = 110°
∠FGH = 110°
Concl: ∠CDE ≅ ∠FGH



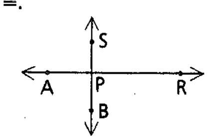
1 ∠CDE = 110°	1 Given
2 ∠FGH = 110°	2 Given
3 ∠CDE ≅ ∠FGH	3 If two ∠s have the same measure, then they are ≅.

5 Given: JK = 2.5 cm
NO = 2.5 cm
Concl: $\overline{JK} \cong \overline{NO}$



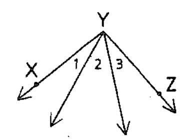
1 JK = 2.5 cm	1 Given
2 NO = 2.5 cm	2 Given
3 $\overline{JK} \cong \overline{NO}$	3 If two segments have the same measure, then they are ≅.

6 Given: Diagram as shown
Prove: ∠APR ≅ ∠SPB

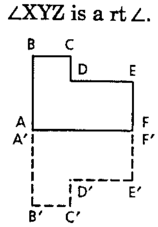


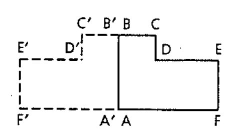
1 Diagram as shown	1 Given
2 ∠APR is a st∠.	2 Assumed from diagram
3 ∠SPB is a st∠.	3 Assumed from diagram
4 ∠APR ≅ ∠SPB	4 If two ∠s are st∠s, then they are ≅.

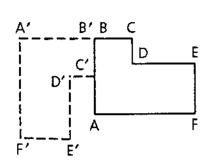
7 Given: ∠1 = 20°
∠2 = 40°
∠3 = 30°
Prove: ∠XYZ is a rt∠.



1 ∠1 = 20°	1 Given
2 ∠2 = 40°	2 Given
3 ∠3 = 30°	3 Given
4 ∠XYZ = 90°	4 Addition (20° + 40° + 30° = 90°)
5 ∠XYZ is a rt∠.	5 If the measure of an ∠ is 90°, then it is a rt∠.

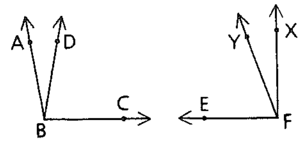
8 **a** 

b 

c 

9 110° **10 a** $P = 4(x + 3)$, $42 = 4x + 12$, $x = 7.5$ **b** $x > 7.5$

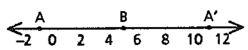
11 Given: $\angle ABD = 10°$
$\angle ABC = 100°$
$\angle EFY = 70° 20'$
$\angle XFY = 19° 40'$



Prove: $\angle DBC \cong \angle XFE$

1 $\angle ABD = 10°$	1 Given
2 $\angle ABC = 100°$	2 Given
3 $\angle EFY = 70° 20'$	3 Given
4 $\angle XFY = 19° 40'$	4 Given
5 $\angle DBC = 90°$	5 Subtraction ($100° - 10° = 90°$)
6 $\angle XFE = 90°$	6 Addition ($70° 20' + 19° 40' = 90°$)
7 $\angle DBC \cong \angle XFE$	7 If two $\angle$s have the same measure, then they are $\cong$.

12 -8 13 a



b yes **c** It is midpt. of $\overline{AA'}$.

14 $5y + 45 < 180$, $5y < 135$, $y < 27$; $5y + 45 > 90$, $5y > 45$, $y > 9$; $9 < y < 27$

15 $x^2 = (x + 7) + (2x - 3)$
$x^2 = 3x + 4$ or $x^2 - 3x - 4 = 0$
$(x - 4)(x + 1) = 0$
$x = 4$ or $x = -1$ but x cannot $= -1$ so $x = 4$.
$\angle D = 5(4) - 4 = 16$ $\angle ABC = x^2 = 16$ $\therefore \angle ABC \cong \angle D$

Pages 32–35 (Section 1.5)

I a $\overline{CO} \cong \overline{DO}$ b $\overline{WX} \cong \overline{WV}$ 2 a $\angle NRO \cong \angle PRO$ b $\angle SXT \cong \angle TXV \cong \angle WXV$ 3 a $\overrightarrow{JG}$ b $\overrightarrow{OK}$ 4 a 30° b 24° 25' **c** $18\frac{1}{4}°$ d 43° 7' 5 a 2; 9 b 14 6 $x + 8 = 22$, $x = 14$; $2x - 6 = 22$, $2x = 28$, $x = 14$; yes

7 $3x - 5 = x + 27$
$2x = 32$, $x = 16$, $\angle FGJ = 3x - 5 = 43$

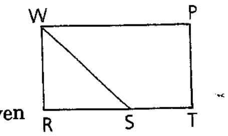
8 a 4 b 8 **c** 1 d 9 e $\overline{BD}$ f no

9 If $\angle ABC$ is trisected, $2x + 10 = x + 20$, $x = 10$, $2(10) + 10 = (10) + 20 = 3(10)$ yes

10 If a ray divides an $\angle$ into two $\cong$ $\angle$s, then the ray bis the $\angle$.

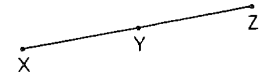
11 If a point divides a segment into 2 $\cong$ segments, then it is the mdpt.

12 Given: $\overrightarrow{WS}$ bis $\angle RWP$.
Prove: $\angle RWS \cong \angle PSW$



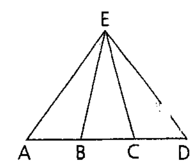
1 $\overrightarrow{WS}$ bis $\angle RWP$.	1 Given
2 $\angle RWS \cong \angle PWS$	2 If a ray bis an $\angle$, it divides an $\angle$ into two $\angle$s.

13 Given: $\overline{XY} \cong \overline{YZ}$
Prove: Y is mdpt of $\overline{XZ}$.



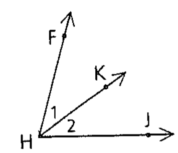
1 $\overline{XY} \cong \overline{YZ}$	1 Given
2 Y is mdpt of $\overline{XZ}$.	2 If a point divides a segment into two $\cong$ segments, then it is the mdpt.

14 Given: $\angle AEB \cong \angle BEC \cong \angle CED$
Concl: $\overrightarrow{EB}$ and $\overrightarrow{ED}$ trisect $\angle AED$.



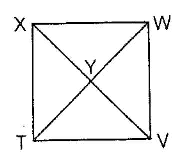
1 $\angle AEB \cong \angle BEC \cong \angle CE$	1 Given
2 $\overrightarrow{ED}$ and $\overrightarrow{ED}$ trisect $\angle AED$.	2 If two rays divide an $\angle$ into three $\angle$s, then they trisect the $\angle$.

15 Given: $\angle 1 \cong \angle 2$
Concl: $\overrightarrow{HK}$ bis $\angle FHJ$.



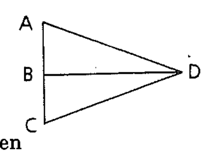
1 $\angle 1 \cong \angle 2$	1 Given
2 $\overrightarrow{HK}$ bis $\angle FHJ$.	2 If a ray divides an $\angle$ into two $\cong$ $\angle$s, it bis the $\angle$.

16 Given: $\angle TXW$ is a rt $\angle$.
$\angle TYV$ is a rt $\angle$.
Prove: $\angle TXW \cong \angle TYV$



1 $\angle TXW$ is a rt $\angle$.	1 Given
2 $\angle TYV$ is a rt $\angle$.	2 Given
3 $\angle TXW \cong \angle TYV$	3 If two $\angle$s are rt $\angle$s, then they are $\cong$.

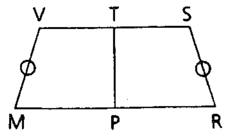
17 Given: B mdpt $\overline{AC}$.
Prove: $\overline{AB} \cong \overline{BC}$



1 B mdpt $\overline{AC}$.	1 Given
2 $\overline{AB} \cong \overline{BC}$	2 If a point is a mdpt, then it divides the segment into two $\cong$ segments.

18 $4x + 3x + 2x = 180°$
$9x = 180°$, $x = 20°$, $m\angle FOG = 80$

19 $18 + 12 + 2x = 62$
$30 + 2x = 62$
$x = 16$, VM = 16

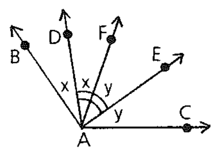


20 a 71° 30' b 80° 32' 20"   x=2

21 ~~a~~ x·2 $x + 3 + 4 + 2x = 15$, $x = 2\frac{2}{3}$; $5\frac{2}{3} \neq 9\frac{1}{3}$ b No

22
$3x - 4y = x - y$
$x - y = y - 10$
$2x - 3y = 0$
$-2[x - 2y = -10]$
$-2x + 4y = 20$
$2x - 3y = 0$
$y = 20$, $x = 30$, $m\angle ROS = y - 10 = 10$

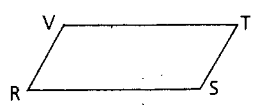
23 $2x + 2y = 120°$
$x + y = 60°$, $m\angle DAE = 60$



24
$5x = \frac{1}{2}(5x - 2x) + 30$
$5x = \frac{3}{2}x + 30$
$x = \frac{60}{7}$, $5x = 42\frac{6}{7}$ or $2x = 17\frac{1}{7}$ or
$5x = \frac{1}{2}(2x - 5x) + 30$
$5x = -\frac{3}{2}x + 30$
$x = \frac{60}{13}$, $5x = 23\frac{1}{13}$ $2x = 9\frac{3}{13}$

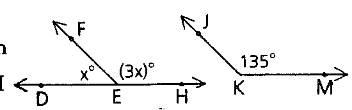
Pages 37–38 (Section 1.6)

1 Given: $\angle V = 119\frac{2}{3}°$
$\angle S = 119° 40'$
Concl: $\angle V \cong \angle S$



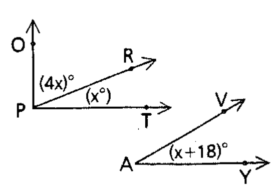
Since there are 60 minutes in 1 degree and 40 is $\frac{2}{3}$ of 60, $119\frac{2}{3}° = 110° 40'$. Angles with the same measure are ≅.

2 Given: Diagram shown
Prove: $\angle FEH \cong \angle JKM$



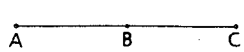
$\angle DEH$ is a st ∠, so $x° + 3x° = 180°$. By solving this $x = 45°$, $3x = 135°$. $\angle FEH$ and $\angle JKM$ have the same measure, so they are ≅.

3 Given: Diagram shown,
$\angle OPT = 90°$
Prove: The measure of $\angle VAY$ is twice that of $\angle RPT$.



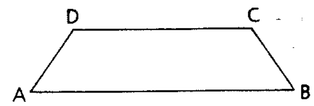
We are given $\angle OPT = 90°$ so $4x° + x° = 90°$, $x = 18°$. Since $x = 18°$, $m\angle RPT = 18$, $m\angle VAY = 36$. 36 is twice 18 so that the measure of $\angle VAY$ is twice that of $\angle RPT$.

4 Given: $AB = x + 4$
$BC = 2x$
$AC = 16$
Concl: $\overline{AB} \cong \overline{BC}$



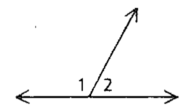
Given that $AB = x + 4$, $BC = 2x$ and $AC = 16$, $x + 4 + 2x = 16$, $3x = 12$, $x = 4$. Then $AB = 8$ and $BC = 8$. They are ≅ because they have the same measure.

5 Given: $\angle D$ is obtuse.
$\angle C > 90°$
Concl: $\angle C \cong \angle D$



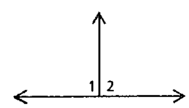
With the information given, this cannot be proved. Although both ∠s are obtuse, they are not necessarily ≅.

6 Given: $\angle 1$ is obtuse.
$\angle 2$ is acute.
Prove: $\angle 1 \cong \angle 2$



This can be proved false because $\angle 1$ is between 90° and 180°, while $\angle 2$ is between 0° and 90°. Angles with different measure cannot be ≅.

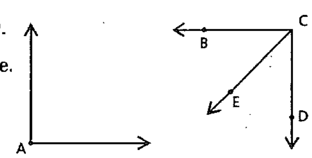
7 Given: Diagram shown,
$\angle 1 \cong \angle 2$
Prove: $\angle 1$ and $\angle 2$ are right angles.



Given that $\angle 1 \cong \angle 2$, $m\angle 1 = m\angle 2$. The diagram shows $m\angle 1 + m\angle 2 = 180$. Therefore, $m\angle 1 = m\angle 2 = 90$ and $\angle 1$ and $\angle 2$ are right angles, by definition of a right angle.

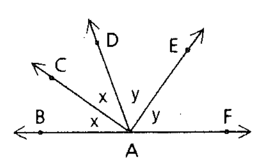
8 Prove: If an obtuse ∠ is bisected, each of the two resulting ∠s are acute.
An obtuse ∠ is between 90° and 180°. If bisected, the ∠s formed would be between 45° and 90°. If an ∠ is between 0° and 90°, it is acute, so the ∠s formed would be acute.

9 Given: $\overrightarrow{CE}$ bisects $\angle BCD$.
$\angle A$ is a right angle.
$m\angle BCE = 45$
Prove: $\angle A \cong \angle BCD$



$m\angle A$ is 90 by definition of a right angle. Since $\overrightarrow{CE}$ bisects $\angle BCD$, $m\angle BCE = m\angle DCE = 45$, and $m\angle BCE + m\angle DCE = 90$. Since $m\angle A = m\angle BCD = 90$, $\angle A \cong \angle BCD$.

10 Given: Diagram shown;
$\overrightarrow{AC}$ bis $\angle BAD$.
$\overrightarrow{AE}$ bis $\angle DAF$.
Prove: $\angle CAE$ is a rt ∠.

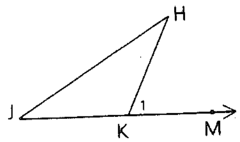


Label the diagram.
Then $2x + 2y = 180$ or
$x + y = 90$
A rt ∠ is 90° so $\angle CAE$ is a rt ∠.

11 Given: $m\angle J + m\angle H + m\angle JKH = 180$

Prove: a $m\angle 1 > m\angle J$

b $m\angle 1 = m\angle J + m\angle H$



b Prove b first.

$m\angle 1 + m\angle H + m\angle JKH = 180$

$m\angle 1 + m\angle JKH = 180$

By substitution,

$m\angle 1 + m\angle JKH = m\angle J + m\angle H + m\angle JKH.$

Subtract $m\angle JKH$ and

$m\angle 1 = m\angle J + m\angle H.$

a From part b,

$m\angle 1 = m\angle J + m\angle H.$

Since each measure is positive,

$m\angle 1 > m\angle J.$

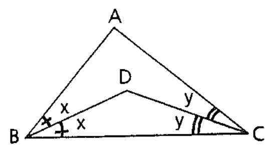
12 Given: $m\angle A + m\angle ABC + m\angle ACB = 180$

$m\angle D + m\angle DBC + m\angle DCB = 180$

$\overrightarrow{BD}$ bis $\angle ABC$,

$\overrightarrow{CD}$ bis $\angle ACB$.

Prove: $m\angle D = 90 + \frac{1}{2}m\angle A$



Label x and y as shown.

$m\angle D + x + y = m\angle A + 2x + 2y$, so

$m\angle D = m\angle A + x + y$. $x + y = 180 - m\angle D$, then

$m\angle D = m\angle A + 180 - m\angle D$, $2m\angle D = 180 + m\angle A$.

Therefore $m\angle D = 90 + \frac{1}{2}m\angle A$.

Pages 42–43 (Section 1.7)

1 undefined terms, postulates, definitions, theorems

2 a reversible b not c not 3 a yes b no 4 a theorem b definition

5 a i If B, then A. ii Wet $\Rightarrow$ rain iii If an angle is acute, then it is a 45° angle. iv If a point divides a segment into two congruent segments, it is the midpoint of the segment.
b i May be either true or false
ii False iii False iv True

6 It is possible but not necessary. 7 No, in flipping a "fair" coin there is always a 50-50 chance it will come up tails. 8 Correct 9 No, we don't know $\angle C$ is acute. 10 No (reasoning from the reverse statement) 11 No (reasoning from the reverse statement) 12 True

13 a i No lilt contains all purrs and there are at least two purrs. ii Lilt contains at least two purrs. Spoof contains at least two purrs. iii No lilt contains all purrs.
b Either two purrs "pil" and "til" are the same or the two hits "mirt" and "girt" are the same.

14

W	J	K	
X	O	O	monkey
O	O	X	croc
O	X	O	lizard

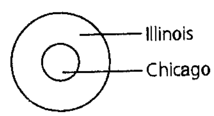
Wendy—purple monkey
Jody—green lizard
Katie—red crocodile

Pages 47–48 (Section 1.8)

1 a If a person is 18 years old, then he or she may vote in a federal election. b If two angles are opposite angles of a parallelogram, then the two angles are congruent.

2 a Converse: If a triangle has a perimeter of 30, then each side has a length of 10. False
Inverse: If not every side of a triangle has a length of 10, then the perimeter is not 30. False
Contrapositive: If the perimeter of a triangle is not 30, then not every side has a length of 10. True
b Converse: If an angle has a measure greater than 0 and less than 90, then the angle is acute. True
Inverse: If an angle is not acute, than it does not have a measure greater than 0 and less than 90. True
Contrapositive: If an angle does not have a measure greater than 0 and less than 90, then it is not acute. True

3 a biconditional



4 a True b False c False d False

5 a d $\Rightarrow$ f b s $\Rightarrow$ p c If bobcats begin to browse, then horses head for home.

6 Converse: If M, A, and B are collinear, then M is the midpoint of AB. False
Inverse: If M is not the midpoint of AB, then M, A, and B are noncollinear. False
Contrapositive: If M, A, and B are noncollinear, then M is not the midpoint of AB. True

7 If a polygon is a square, then it is a quadrilateral with four congruent sides.
Converse: If a quadrilateral has four congruent sides, then it is a square.
Inverse: If a polygon is not a square, then it is not a quadrilateral with four congruent sides.
Contrapositive: If a quadrilateral does not have four congruent sides, then it is not a square.

8 a Converse: If a ray divides an angle into two congruent angles, then it bisects the angle.
Inverse: If a ray does not bisect an angle, then it does not divide the angle into two congruent angles.
Contrapositive: If a ray does not divide an angle into two congruent angles, then it does not bisect the angle.
b Converse: If two angles of a triangle are congruent, then the sides opposite those angles are congruent.
Inverse: If two sides of a triangle are not congruent, then the angles opposite those sides are not congruent.
Contrapositive: If two angles of a triangle are not congruent, then the sides opposite those angles are not congruent.

9 $p \Rightarrow \sim g$ 10 At least one of the given statements is false.

Pages 51–52 (Section 1.9)

1 $\frac{3}{5}$ 2 $\frac{1}{5}$ 3 $\frac{1}{5}$ 4 0 5 $\frac{1}{3}$ 6 Possibilities are ∠s AB, BC, CD, DE, AC, BD, CE, AD, BE, AE; $\frac{3}{10}$

7 $\frac{2}{5}$ 8 $\frac{1}{10}$ 9 $\frac{3}{5} \cdot \frac{3}{5} = \frac{9}{25}$ 10 $\frac{2}{5}$ 11 $\frac{5}{12}$ 12 ∠A, ∠B ∠B, ∠C ∠C, ∠D ∠D, ∠E ∠A, ∠C ∠B, ∠D ∠C, ∠E ∠A, ∠D ∠B, ∠E ∠A, ∠E $\frac{1}{10}$ 13 18 14 a 1 b $\frac{1}{10}$ c 0 15 a $\frac{4}{5}$ b $\frac{4}{5}$

Pages 54–59 Chapter 1 Review Problems

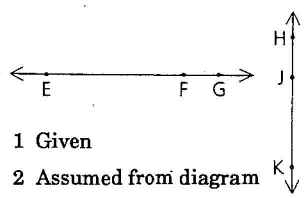
1 a $\overleftrightarrow{AR}$, $\overrightarrow{AD}$, $\overrightarrow{RA}$, $\overrightarrow{RD}$, $\overrightarrow{DA}$, $\overrightarrow{DR}$ b $\overrightarrow{BA}$, $\overrightarrow{BC}$ c $\overrightarrow{DF}$ d $\overline{CB}$ e 60°, 52°, 120° f no g No angle can be called ∠B since 3 angles have B as a vertex. h $\overleftrightarrow{AC}$ i $\overline{EF}$ j ∠1 k A 1 $\overline{FE}$

2 ∠DEF is straight. a right b obtuse c acute d straight e right 3 a 69° 4' 35" b 50° 59' 43" 4 a 46° 52' 30" b $132\frac{1}{10}$° 5 a $\overline{BC} \cong \overline{RT}$ b ∠A ≅ ∠S 6 a no b yes

7 2x + 5 = 50 – 4x, 6x = 45, x = 7.5; 2x + 5 = 20

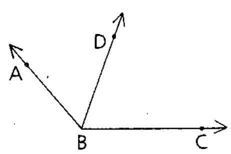
8 6x = 180, x = 30, m∠1 = 30, m∠2 = 90, m∠3 = 90 9 no

10 Given: Diagram as shown
Prove: ∠EFG ≅ ∠HJK



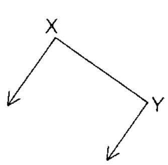
1 Diagram as shown	1 Given
2 ∠EFG is a st∠.	2 Assumed from diagram
3 ∠HJK is a st∠.	3 Assumed from diagram
4 ∠EFG ≅ ∠HJK	4 If two ∠s are st∠s, then they are ≅.

11 Given: ∠ABC = 130°, ∠ABD = 60°
Prove: ∠DBC is acute.



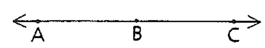
1 ∠ABC = 130°	1 Given
2 ∠ABD = 60°	2 Given
3 ∠DBC = 70°	3 Subtraction
4 ∠DBC is acute.	4 An ∠ > 0 and < 90 is acute.

12 Given: ∠X is a rt∠. ∠Y is a rt∠.
Prove: ∠X ≅ ∠Y



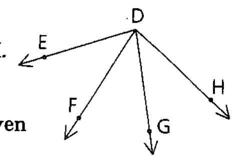
1 ∠X is a rt∠.	1 Given
2 ∠Y is a rt∠.	2 Given
3 ∠X ≅ ∠Y	3 If two ∠s are rt∠s, then they are ≅.

13 Given: $\overline{AB} \cong \overline{BC}$
Prove: B mdpt of $\overline{AC}$.



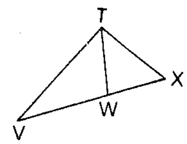
1 $\overline{AB} \cong \overline{BC}$	1 Given
2 B mdpt of $\overline{AC}$.	2 If a point divides a segment into two ≅ segments, then it is the mdpt.

14 Given: $\overrightarrow{DF}$ and $\overrightarrow{DG}$ trisect ∠EDH.
Concl: ∠EDF ≅ ∠FDG ≅ ∠GDH



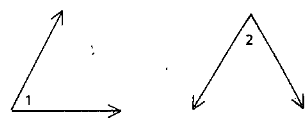
1 $\overrightarrow{DF}$ and $\overrightarrow{DG}$ trisect ∠EDH.	1 Given
2 ∠EDF ≅ ∠FDG ≅ ∠GDH	2 If two rays trisect an ∠, they divide it into three ≅ ∠s.

15 Given: $\overrightarrow{TW}$ bis ∠VTX.
Prove: ∠VTW ≅ ∠XTW



1 $\overrightarrow{TW}$ bis ∠VTX.	1 Given
2 ∠VTW ≅ ∠XTW	2 If a ray bis an ∠, it divides it into 2 ≅ ∠s.

16 Given: ∠1 = 61.6°
∠2 = $61\frac{3}{5}$°
Prove: ∠1 ≅ ∠2



Since there are 60' in each degree, 61.6° = $61\frac{3}{5}$°. The ∠s have the same measure and are ≅.

17 a –3 b –13 18 5 19 a $\frac{2}{5}$ b $\frac{1}{10}$ 20 $\frac{1}{3}$ of 40.2° m∠POR = 13° 24' 21 a 30° b 140° c $127\frac{1}{2}$°

22 Converse: If the angle formed by the hands of a clock is acute, then the time is 2:00. False
Inverse: If the time is not 2:00, then the angle formed by the hands is not acute. False
Contrapositive: If the angle formed by the hands of the clock is not acute, then the time is not 2:00. True

23
$$\begin{aligned} PR = 26, P &= 5RS + 10 \\ 2PR + 2RS &= 5RS + 10 \\ 42 &= 3RS \\ 14 &= RS \end{aligned}$$

24 a $(x + 3y) + (2x + y) = 90$

$3x + 4y = 90$

$y = -\frac{3}{4}x + 22\frac{1}{2}$

b $x + 3y = 45$

$2x + y = 45$

$-2x - 6y = -90$ $\quad$ $x + 3y = 45$

$\underline{2x + y = 45}$ $\quad$ $x + 3(9) = 45$

$-5y = -45$ $\quad$ $x + 27 = 45$

$y = 9$ $\quad$ $x = 18$

25 15

26 $\angle A = 2\angle B = 6° \text{ and } \angle A + \angle B = 42°$

so $2\angle B + 6° + \angle B = 42°$

$3\angle B = 36°$

$\angle B = 12°$

$\angle A = 2(12°) + 6° = 30°$

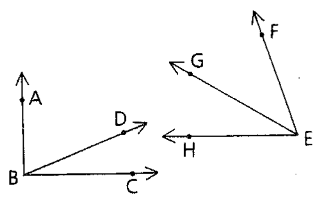
27 Given: $\angle ABC$ is a rt $\angle$.

$\angle DBC = 20°$,

$\angle FEG = 40°$,

$\angle GEH = 30°$

Prove: $\angle ABD \cong \angle FEH$



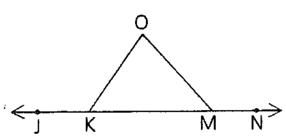
1 $\angle ABC$ is a rt $\angle$.	1 Given
2 $\angle DBC = 20°$	2 Given
3 $\angle FEG = 40°$	3 Given
4 $\angle GEH = 30°$	4 Given
5 $\angle ABC = 90°$	5 A rt $\angle$ is exactly 90°.
6 $\angle ABD = 70°$	6 Subtraction
7 $\angle FEH = 70°$	7 Addition
8 $\angle ABD \cong \angle FEH$	8 If two $\angle$s have the same measure, then they are $\cong$.

28 Given: $\angle OMK = 50°$

$\angle OMK = (2x)°$

$\angle OKJ = (5x + 5)°$

Concl: $\angle OKJ \cong \angle OMN$



$\angle OKM$ and $\angle OKJ$ are supplementary, so

$2x + 5x + 5 = 180$, $7x = 175$, $x = 25$.

Since $x = 25$, $m\angle OKM = 50$, $m\angle OMK = 50$.

$\angle OKJ$ and $\angle OMN$ are supps of $\cong \angle$s, and are $\cong$.

29 180 – (60° 29' + 70° 40' 16") = 48° 50' 44" 30 20°

31 a $812x + 2469x = 180$, $3381x = 180$, $x \approx .055$; $812x \approx 44.5°$ b $\approx 44°33'$ 32 $\frac{1}{3}$ 33 $7 < PR < 31$

34 $(2x - y) + (3y - x) = 25$ $\quad$ $2x - y = 3y - x$

$x + 2y = 25$ $\quad$ $3x - 4y = 0$

$2x + 4y = 50$

$\underline{3x - 4y = 0}$ $\quad$ $20 - y = 3y - 10$

$5x = 50$ $\quad$ $30 = 4y$

$x = 10$ $\quad$ $7\frac{1}{2} = y$

35 a $90 < m\angle Q < 180$ b $59 < x < 104$

36 $x^2 - 27x = 90$

$x^2 - 27x - 90 = 0$

$(x - 30)(x + 3) = 0$

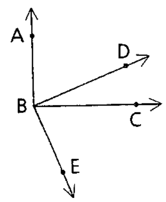
$x = 30 \text{ or } x = -3$

37 $0 < w < 6$

38 Given: $\angle ABC$ is a rt $\angle$.

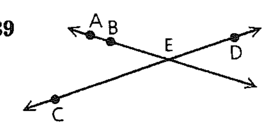
$\angle DBE$ is a rt $\angle$.

Prove: $\angle ABD \cong \angle CBE$



$\angle ABC$ and $\angle DBE$ are rt $\angle$s, so they are $\cong$. $\angle DBC$ is part of both angles. By subtraction, $\angle ABD \cong \angle CBE$.

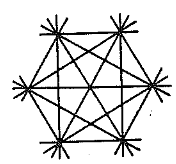
39



40 a $\frac{3}{10}$ b $\frac{4}{10} \cdot \frac{3}{9} = \frac{2}{15}$ c $(\frac{2}{10} \cdot \frac{3}{9}) + (\frac{3}{10} \cdot \frac{2}{9}) = \frac{2}{15}$ d $\frac{4}{10} \cdot \frac{4}{10} = \frac{4}{25}$

e no, the odds are not good 41 One rt $\angle$ is formed every $\frac{6}{11}$ hours. $\frac{6}{11}(60) = 32\frac{8}{11}$ min. $\frac{8}{11}$ min = 44 sec. Approx. 32 min, 44 sec past 3:00

42



a 15 b 7

43 $m\angle$ at 2:00 = 60, $60 \times 2\frac{1}{2} = 150$, $\frac{150}{360}$ or $\frac{5}{12}$

The hands of the clock are together every $\frac{12}{11}$ hours, $\frac{5}{10} \times \frac{12}{11} = \frac{6}{11}$ hours after they last came together at $2\frac{2}{11}$. The time is $2\frac{7}{11}$ hours or approximately 38 min, 11 sec past 2:00.