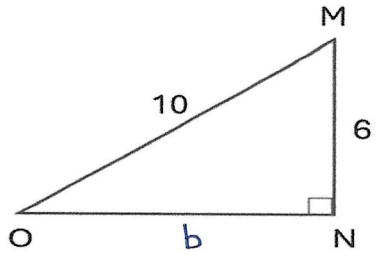
Triangles. Form A

1. Given right triangle ΔMNO below, how many units long is $\overline{NO}$?

(A) $2\sqrt{2}$
(B) 4
(C) 6
(D) $\sqrt{60}$
(E) 8



① This is a 10-6-8 or 5-3-4 Δ

② You could use Pythagorean Thm

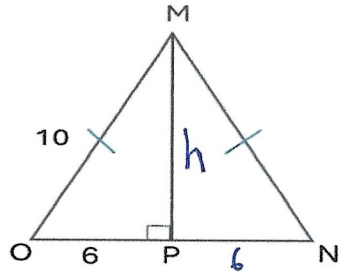
$10^2 = 6^2 + b^2$
$100 = 36 + b^2$
$64 = b^2 \Rightarrow b = 8$

2. For triangle ΔMNO below, $\overline{MN}$ is congruent to $\overline{MO}$. *If* $\overline{MO}$ = 10 units, and $\overline{PO}$ = 6 units. What is the area of the triangle ΔMNO *in square units*?

Isosceles Triangle

$h = 8$ → same explanation as above.

(A) 24
(B) 48
(C) 60
(D) 30
(E) 120



$A = \frac{1}{2}bh$

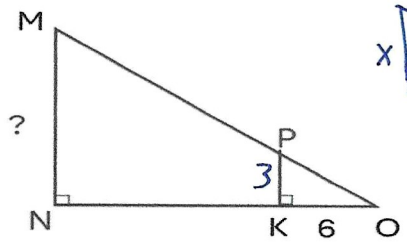
$A = \frac{1}{2}(6+6)8 = \frac{1}{2}(12)(8)$

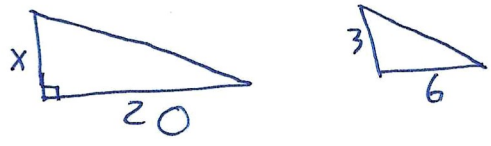
$= 48$

3. In the right triangle ΔMON below, $\overline{PK}$ is parallel to $\overline{MN}$, and $\overline{PK}$ is perpendicular to $\overline{NO}$ at K. The length of $\overline{NO}$ is 20 feet, the length of $\overline{PK}$ is 3 feet, and the length of $\overline{OK}$ is 4 feet. What is the length, in feet, of $\overline{MN}$?

Similar Triangles

(A) 10
(B) 12
(C) 15
(D) 16
(E) 17



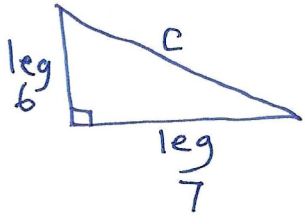


$\frac{x}{3} = \frac{20}{6}$

$x = \frac{(20)(3)}{6} = 10$

4. What is the perimeter, in feet, of a right triangle with legs that are 6 feet long and 7 feet long, respectively?

(A) $\sqrt{13}$
(B) 21
(C) $\sqrt{85} + 13$



$c^2 = 6^2 + 7^2$

$c^2 = 36 + 49 = 85$

$c = \sqrt{85}$

$P = 6 + 7 + \sqrt{85} = 13 + \sqrt{85}$

(D) $\sqrt{85}$

(E) $\sqrt{85} + \sqrt{13}$

5. In the figure below, $\angle BAC$ measures 30°, angle $\angle ABC$ measures 110°, and points B, C, and D are collinear. What is the measure of $\angle ACD$?

on same straight line

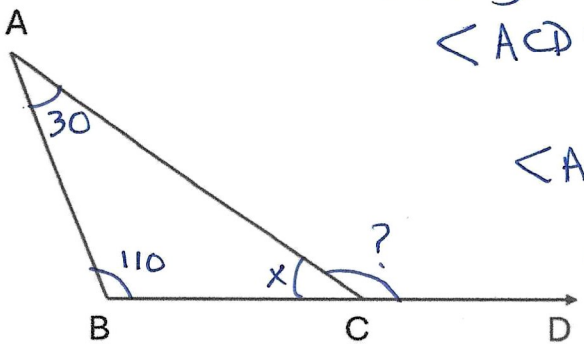
(A) 150°

(B) 140°

(C) 130°

(D) 120°

(E) 110°



* Using external Angle Thm:

$\angle ACD$ = sum of two opposite internal angles

$\angle ACD = 30 + 110 = 140$

* You could also solve by

$30 + 110 + x = 180$

$x = 180 - 140 = 40$

SO $\angle ACD = 180 - 40 = 140$

6. In the figure below, where $\Delta ABC \sim \Delta KLM$, lengths given are in centimeters. What is the perimeter, in centimeters, of ΔABC? Similar Triangles

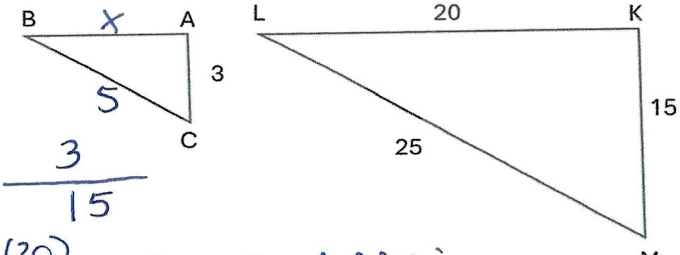
(A) 14

(B) 12

(C) $21\frac{1}{2}$

(D) 60

(E) $71\frac{3}{4}$



$\frac{x}{20} = \frac{3}{15}$

$x = \frac{(3)(20)}{15} = 4$ SO ΔABC is a 345 Triangle

$P = 3+4+5$

$P = 12$

7. In the figure below, $\overline{MN} \parallel \overline{PQ}$ and segment PN intersects segment MQ at O. What is the length of segment MQ? Parallel

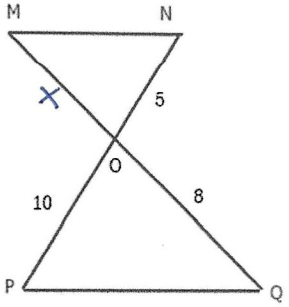
(A) 4

(B) 24

(C) 12

(D) 49

(E) $15\sqrt{7}$



MNO and OPQ are similar triangles

$\frac{5}{10} = \frac{x}{8}$

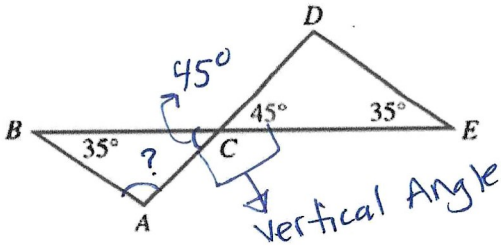
$\frac{1}{2} = \frac{x}{8}$

$x = \frac{8}{2} = 4$

$MQ = 4 + 8 = 12$

8. In the figure below, C is the intersection of $\overline{AD}$ and $\overline{BE}$. If it can be determined, what is the measure of $\angle BAC$?

(A) 80°
(B) 100°
(C) 110°
(D) 45°
(E) 90°



Vertical Angles are equal

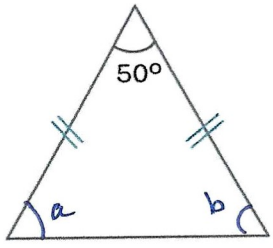
$35+45+?=180$

$?=180-80=100$

9. The isosceles triangle below has one angle measure as shown. What is the measure of each of the other angles?

→ means opposite angles a and b are equal

(A) 30°
(B) 45°
(C) 50°
(D) 65°
(E) 130°



$50+a+b=180$

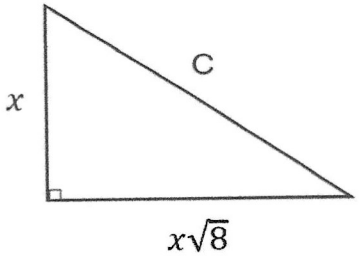
$a+b=180-50$

$a+b=130$

So a or b $=\frac{130}{2}=65$

10. In the figure below, what is an expression for C in terms of x?

(A) $x^2+\sqrt{8}$
(B) $x+8$
(C) $3x$
(D) 8
(E) $3x+\sqrt{8}$



$C^2=x^2+(x\sqrt{8})^2$

$C^2=x^2+x^2(\sqrt{8})^2$

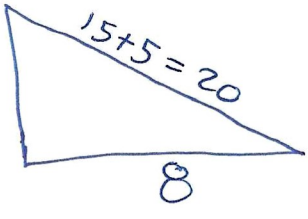
$C^2=x^2+8x^2$

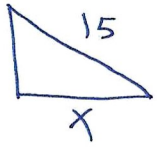
$C^2=9x^2$

$C=\sqrt{9x^2}=3x$

11. In the right triangle ΔMON below, $\overline{PK}$ is parallel to $\overline{NO}$, and $\overline{PK}$ is perpendicular to $\overline{MN}$ at P. The length of $\overline{MK}$ is 15 feet, the length of $\overline{KO}$ is 5 feet, and the length of $\overline{NO}$ is 8 feet. What is the length, in feet, of $\overline{PK}$?

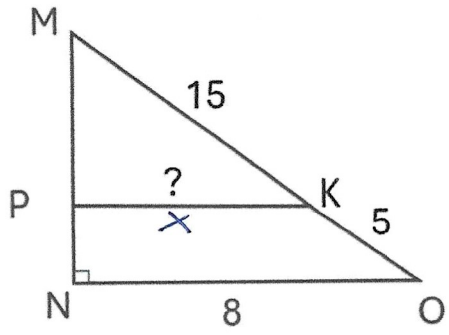
Triangles MON and MKP are similar





⇒

(A) 6
(B) 8
(C) 125
(D) $\sqrt{8}$
(E) $5\sqrt{8}$



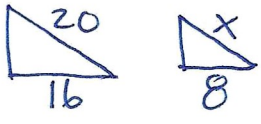
$\frac{x}{8} = \frac{15}{20}$

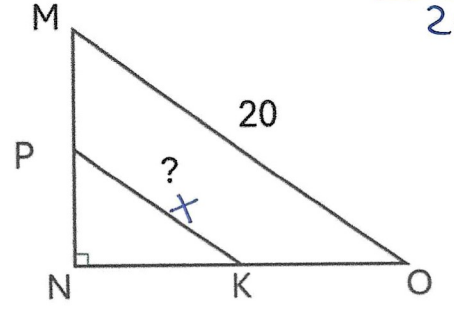
$x = \frac{(8)(15)}{20}$

$x = 6$

12. In the right triangle ΔMON below, $\overline{PK}$ is parallel to , and $\overline{NK} \cong \overline{KO}$. The length of $\overline{NK}$ is 8 feet, the length of $\overline{NO}$ is 16 feet, and the length of $\overline{MO}$ is 20 feet. What is the length, in feet, of $\overline{PK}$?

(A) 10
(B) 8
(C) 125
(D) $\sqrt{8}$
(E) $5\sqrt{8}$





$\frac{x}{20} = \frac{8}{16}$

$x = \frac{(20)(8)}{16}$

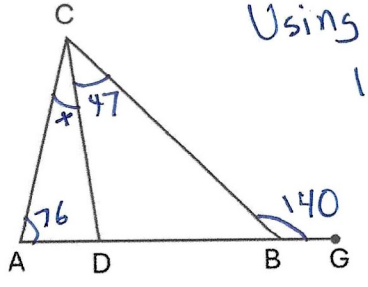
$x = 10$

13. In the figure below, A, D, B, and G are collinear. If $\angle CAD$ measures 76°, $\angle BCD$ measures 47°, and $\angle CBG$ measures 140°, what is the degree measure of $\angle ACD$?

external Angle

x

(A) 12°
(B) 14°
(C) 17°
(D) 36°
(E) 43°



Using external Angle Thm

$140 = x + 47 + 76$

$x = 140 - 47 - 76$

$x = 17$

14. The area of the right triangle ΔMON is:

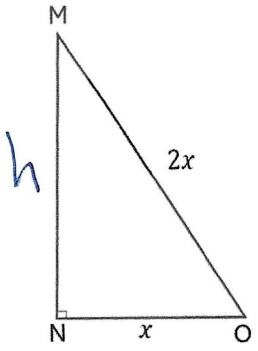
(A) $\frac{\sqrt{3}}{2}x^2$

(B) x^2

(C) $\frac{\sqrt{5}}{2}x^2$

(D) $\sqrt{2x}$

(E) $\frac{3}{2}x^2$



Find the height h

$(2x)^2 = h^2 + x^2$

$4x^2 = h^2 + x^2$

$h^2 = 4x^2 - x^2 = 3x^2$

$h = \sqrt{3x^2} = \sqrt{3}\,x$

$A = \frac{1}{2}$ base. height $= \frac{1}{2} \times (\sqrt{3}\,x) = \frac{1}{2}\sqrt{3}\,x^2$

15. In the figure below, equilateral triangle ΔMNP has a side length of 10 inches. What's the area of the circle centered at O in inches square?

(A) $\sqrt{75}\pi$

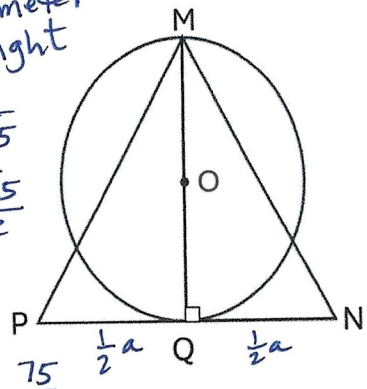
(B) $\frac{\sqrt{75}}{4}\pi$

(C) $\frac{75}{4}\pi$

(D) 25π

(E) $\sqrt{\frac{75}{4}}\pi$

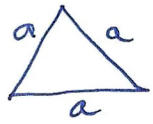
For area of ○
MQ is the diameter
which is the height
of triangle
SO Diameter $= \sqrt{75}$
radius or $r = \frac{\sqrt{75}}{2}$



$A_{circle} = \pi r^2$

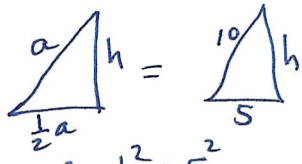
$= \pi\left(\frac{\sqrt{75}}{2}\right)^2 = \pi\,\frac{75}{4}$

For Triangle



$PQ = \frac{1}{2}a$

$QN = \frac{1}{2}a$



$10^2 = h^2 + 5^2$

$h^2 = 100 - 25 = 75$

$h = \sqrt{75}$

16. In the right triangle below, $MO = 10$ units, and $NO = 4$ units. What is the sine of $\angle MON$?

(A) $\frac{\sqrt{84}}{10}$

(B) $\frac{2}{5}$

(C) $\sqrt{84}$

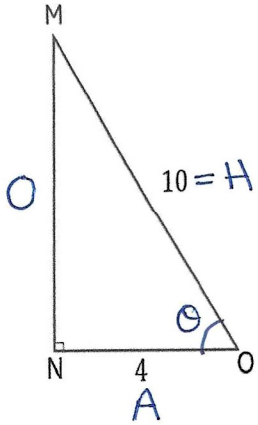
(D) $\frac{\sqrt{84}}{4}$

(E) $\sqrt{\frac{21}{5}}$

$\sin\theta = \frac{O}{H}$

$= \frac{\sqrt{84}}{10}$

SOHCAHTOA



$10^2 = 4^2 + O^2$

$O^2 = 100 - 16 = 84$

$O = \sqrt{84}$

17. In the figure below, equilateral triangle ΔMNP has a side length of 8 inches. What's the cosine of $\angle MPN$?

all sides equal

SOHCAHTOA

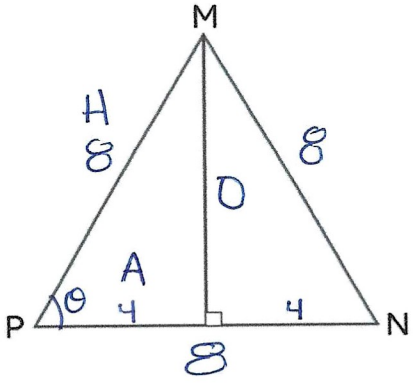
(A) $\frac{\sqrt{48}}{8}$

(B $\frac{\sqrt{48}}{4}$

(C) $\frac{\sqrt{2}}{3}$

(D) $\frac{4}{\sqrt{84}}$

(E) $\frac{1}{2}$



$\cos\theta = \frac{A}{H}$

$= \frac{4}{8} = \frac{1}{2}$

$8^2 = 4^2 + O^2$

$O^2 = 64 - 16 = 48$

$O = \sqrt{48}$

No need to find this for the problem. Solved to show you the trap of where $\sqrt{48}$ is coming from

18. In the right triangle ΔMON, the tangent of $\angle OMN$ is $\frac{3}{7}$. What is the length of segment MN?

SOHCAHTOA

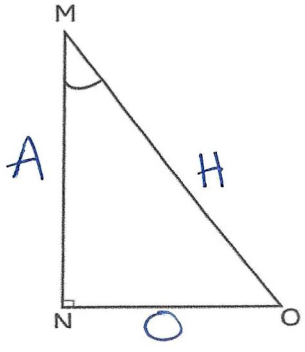
(A) 3

(B) $\sqrt{40}$

(C) $\sqrt{21}$

(D) 7

(E) $\sqrt{\frac{40}{3}}$

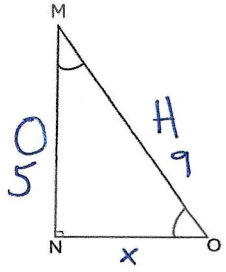


$\frac{3}{7} = \frac{O}{A}$ so $O=3$, $A=7$

19. In the right triangle ΔMON, the sine of $\angle O$ is $\frac{5}{9}$. What is the length of segment NO?

SOH CAH TOA

(A) 5
(B) $\sqrt{56}$
(C) $\sqrt{106}$
(D) 9
(E) 45



$\frac{5}{9} = \frac{O}{H}$

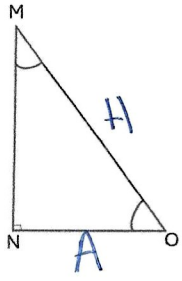
$9^2 = 5^2 + x^2$

$x^2 = 81 - 25 = 56$

$x = \sqrt{56}$

20. In the right triangle ΔMON, the cosine of $\angle O$ is $\frac{3}{8}$. What is the length of segment NO?

(A) 24
(B) $\sqrt{73}$
(C) $\sqrt{55}$
(D) 8
(E) 3



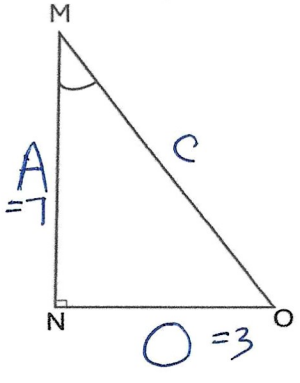
CAH

$\frac{3}{8} = \frac{A}{H}$ $A = 3 = NO$

$H = 8$

21. In the right triangle ΔMON, the tangent of $\angle M$ is $\frac{3}{7}$. What is the length of segment MO?

(A) 3
(B) $\sqrt{40}$
(C) $\sqrt{58}$
(D) 7
(E) 21



TOA

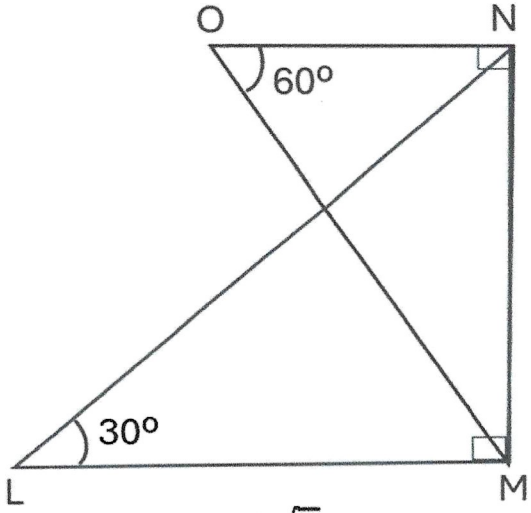
$\frac{3}{7} = \frac{O}{A}$ $O = 3$ $A = 7$

$c^2 = 3^2 + 7^2$

$c^2 = 9 + 49 = 58$

$c = \sqrt{58}$

22. For the triangles in the figure below, what is the length of segment MN?

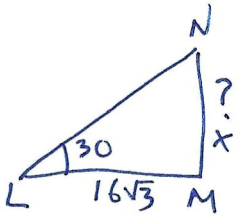


$16\sqrt{3}$

	30°	60°
$sin\theta$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$
$cos\theta$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$
$tan\theta$	$\frac{\sqrt{3}}{3}$	$\sqrt{3}$

(A) 16
(B) $\sqrt{40}$
(C) $8\sqrt{3}$
(D) 24
(E) 8

$\tan 30 = \frac{O}{A}$

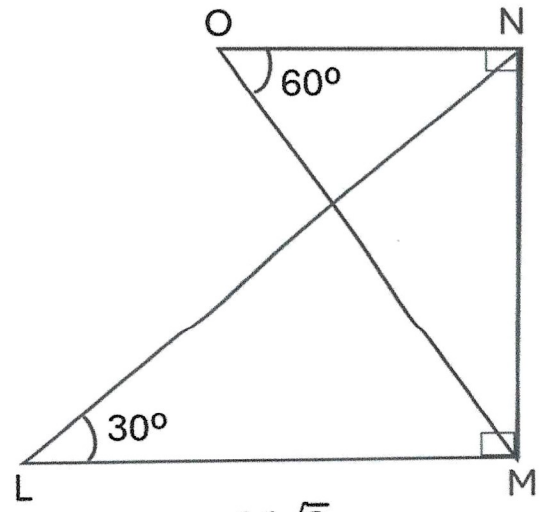


TOA

$\tan 30 = \frac{x}{16\sqrt{3}}$

$\frac{\sqrt{3}}{3} = \frac{x}{16\sqrt{3}} \Rightarrow X = \frac{16\sqrt{3}\sqrt{3}}{3} = \frac{16\sqrt{9}}{3} = \frac{16 \cdot 3}{3} = 16$

23. For the triangles in the figure below, what is the length of segment NO?



$16\sqrt{3}$

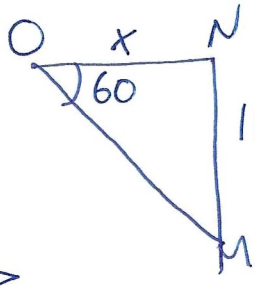
	30°	60°
$sin\theta$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$
$cos\theta$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$
$tan\theta$	$\frac{\sqrt{3}}{3}$	$\sqrt{3}$

(A) $\frac{1}{\sqrt{3}}$

$\tan 60 = \frac{16}{x}$

$\sqrt{3} = \frac{16}{x}$

TOA



→ from previous problem

$\Rightarrow$

(B) $\frac{16}{\sqrt{3}}$

(C) $\frac{\sqrt{3}}{16}$

(D) $\sqrt{\frac{3}{16}}$

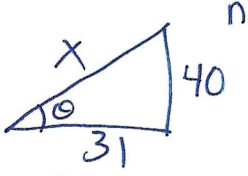
(E) $\sqrt{\frac{16}{3}}$

$x\sqrt{3} = 16$

$x = \frac{16}{\sqrt{3}}$

24. A laser is placed at a distance of 31 meters from the base of a tower that is 40 meters tall. What is the angle of the laser from the ground level in order that it points at the top of the tower?

not to scale



TOA

$\tan\theta = \frac{40}{31}$

$\theta = \tan^{-1}\left(\frac{40}{31}\right)$

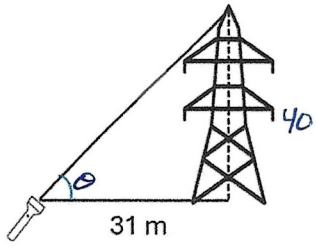
(A) $tan^{-1}(\frac{31}{40})$

(B) $sin^{-1}(\frac{31}{40})$

(C) $cos^{-1}(\frac{31}{40})$

(D) $tan^{-1}(\frac{40}{31})$

(E) $tan(\frac{40}{31})$



25. A hiker climbs a mountain that has a base of x units, and a height of $50x$ units. What is the approximate length of the mountain's incline if it's modeled as a straight line?

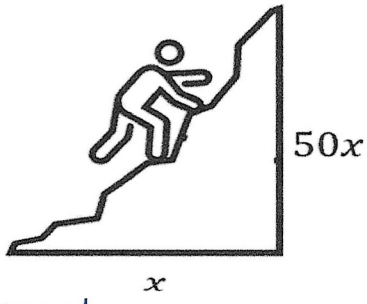
(A) $2501x$

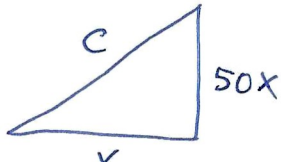
(B) $\sqrt{2504x}$

(C) $\sqrt{51}\,x$

(D) $\sqrt{2501}\,x$

(E) $51x^2$





$c^2 = x^2 + (50x)^2$

$c^2 = x^2 + 2{,}500x^2$

$c^2 = 2501x^2$ $\quad c = \sqrt{2501x^2}$

$= \sqrt{2501}\,x$

base angles are equal

26. In a given isosceles triangle, the measure of each of the base angles is four times the measure of the vertex angle. What is the measure, in degrees, of the vertex angle?

(A) 20°

(B) 30°

$a = 4v$

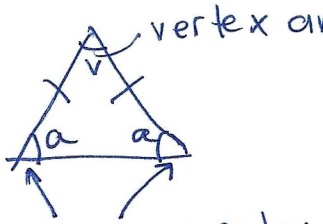
For the triangle

$a + a + v = 180°$

$4v + 4v + v = 180$

$9v = 180$

$v = \frac{180}{9} = 20$



(C) 45°
(D) 70°
(E) 80°

Answers

1. E	11. A	21. C
2. B	12. A	22. A
3. A	13. C	23. B
4. C	14. A	24. D
5. B	15. C	25. A
6. B	16. A	26. A
7. C	17. E	
8. B	18. D	
9. D	19. B	
10. C	20. E	