

12. [Square Roots]

Skill 12.1 Calculating square roots of perfect squares.

MM5.2 1 2 2 3 3 4 4
MM10 1 1 2 2 3 3 4 4

- Estimate which number, multiplied by itself, produces the number under the square root sign.
 - Check your estimation by multiplying your guess by itself.
- Hint: Calculating the square root is the opposite to squaring.*

Q. $\sqrt{2500} =$

A. $\sqrt{2500} =$
 $= \sqrt{50 \times 50}$
 $= 50$

a) $\sqrt{25} =$

$= \sqrt{5 \times 5} = \boxed{5}$

b) $\sqrt{4} =$

$= \dots = \boxed{}$

c) $\sqrt{9} =$

$= \dots = \boxed{}$

d) $\sqrt{49} =$

$= \dots = \boxed{}$

e) $\sqrt{81} =$

$= \dots = \boxed{}$

f) $\sqrt{64} =$

$= \dots = \boxed{}$

g) $\sqrt{121} =$

$= \dots = \boxed{}$

h) $\sqrt{1} =$

$= \dots = \boxed{}$

i) $\sqrt{169} =$

$= \dots = \boxed{}$

j) $\sqrt{16} =$

$= \dots = \boxed{}$

k) $\sqrt{36} =$

$= \dots = \boxed{}$

l) $\sqrt{400} =$

$= \dots = \boxed{}$

m) $\sqrt{100} =$

$= \dots = \boxed{}$

n) $\sqrt{196} =$

$= \dots = \boxed{}$

o) $\sqrt{144} =$

$= \dots = \boxed{}$

p) $\sqrt{225} =$

$= \dots = \boxed{}$

q) $\sqrt{256} =$

$= \dots = \boxed{}$

r) $\sqrt{10\,000} =$

$= \dots = \boxed{}$

s) $\sqrt{3600} =$

$= \dots = \boxed{}$

t) $\sqrt{8100} =$

$= \dots = \boxed{}$

u) $\sqrt{4900} =$

$= \dots = \boxed{}$

Skill 12.2 Calculating square roots of perfect squares in fraction form.

MM5.2 1 2 2 3 3 4 4
MM10 1 1 2 2 3 3 4 4

- If the number is a mixed number, convert it to an improper fraction first.
- Estimate which number multiplied by itself produces the numerator.
- Estimate which number multiplied by itself produces the denominator.
- Check your estimation by multiplying your guess by itself.

Hint: Calculating the square root is the opposite to squaring.

Q. $\sqrt{5\frac{4}{9}} =$

A. $\sqrt{5\frac{4}{9}} =$

$= \sqrt{\frac{5 \times 9 + 4}{9}}$

Change the mixed number to an improper fraction

$= \sqrt{\frac{49}{9}} = \frac{\sqrt{49}}{\sqrt{9}} = \frac{\sqrt{7 \times 7}}{\sqrt{3 \times 3}}$

Find the square root of the numerator and the denominator

$= \frac{7}{3} = 2\frac{1}{3}$

a) $\sqrt{\frac{1}{36}} =$

$= \sqrt{\frac{1}{6 \times 6}} = \boxed{\frac{1}{6}}$

b) $\sqrt{\frac{1}{16}} =$

$= \dots = \boxed{\phantom{\frac{1}{6}}}$

c) $\sqrt{\frac{4}{25}} =$

$= \dots = \boxed{\phantom{\frac{1}{6}}}$

d) $\sqrt{\frac{100}{144}} =$

$= \dots = \boxed{\phantom{\frac{1}{6}}}$

e) $\sqrt{\frac{16}{121}} =$

$= \dots = \boxed{\phantom{\frac{1}{6}}}$

f) $\sqrt{\frac{25}{81}} =$

$= \dots = \boxed{\phantom{\frac{1}{6}}}$

g) $\sqrt{1\frac{7}{9}} =$

$= \dots = \boxed{\phantom{\frac{1}{6}}}$

h) $\sqrt{2\frac{1}{4}} =$

$= \dots = \boxed{\phantom{\frac{1}{6}}}$

i) $\sqrt{1\frac{11}{25}} =$

$= \dots = \boxed{\phantom{\frac{1}{6}}}$

j) $\sqrt{20\frac{1}{4}} =$

$= \dots = \boxed{\phantom{\frac{1}{6}}}$

k) $\sqrt{1\frac{17}{64}} =$

$= \dots = \boxed{\phantom{\frac{1}{6}}}$

l) $\sqrt{3\frac{1}{16}} =$

$= \dots = \boxed{\phantom{\frac{1}{6}}}$

m) $\sqrt{11\frac{1}{9}} =$

$= \dots = \boxed{\phantom{\frac{1}{6}}}$

n) $\sqrt{1\frac{15}{49}} =$

$= \dots = \boxed{\phantom{\frac{1}{6}}}$

o) $\sqrt{4\frac{21}{25}} =$

$= \dots = \boxed{\phantom{\frac{1}{6}}}$

Skill 12.3 Calculating square roots of perfect squares in decimal form.

MM5.2 11 22 33 44
MM10 11 22 33 44

- Estimate which number, multiplied by itself, produces the number under the square root sign.
 - Check your estimation by multiplying your guess by itself.
 - Given the number is a decimal number consider the position of the decimal point.
- Hint: Calculating the square root is the opposite to squaring.*

Q. $\sqrt{0.04} =$

A. $\sqrt{0.04} =$
 $= \sqrt{0.2 \times 0.2}$
 $= 0.2$

a) $\sqrt{0.01} =$

$= \dots = \boxed{}$

b) $\sqrt{0.16} =$

$= \dots = \boxed{}$

c) $\sqrt{0.25} =$

$= \dots = \boxed{}$

d) $\sqrt{0.36} =$

$= \dots = \boxed{}$

e) $\sqrt{1.69} =$

$= \dots = \boxed{}$

f) $\sqrt{0.64} =$

$= \dots = \boxed{}$

g) $\sqrt{1.96} =$

$= \dots = \boxed{}$

h) $\sqrt{0.09} =$

$= \dots = \boxed{}$

i) $\sqrt{2.56} =$

$= \dots = \boxed{}$

j) $\sqrt{0.49} =$

$= \dots = \boxed{}$

k) $\sqrt{6.25} =$

$= \dots = \boxed{}$

l) $\sqrt{0.81} =$

$= \dots = \boxed{}$

m) $\sqrt{1.44} =$

$= \dots = \boxed{}$

n) $\sqrt{1.21} =$

$= \dots = \boxed{}$

o) $\sqrt{2.25} =$

$= \dots = \boxed{}$

p) $\sqrt{4.41} =$

$= \dots = \boxed{}$

q) $\sqrt{5.76} =$

$= \dots = \boxed{}$

r) $\sqrt{6.76} =$

$= \dots = \boxed{}$

Skill 12.4 Calculating multiples of square roots.

MM5.2 11 2 33 44
MM10 11 2 33 44

- Find the square root. (see skill 12.1, page 123)
- Multiply the whole numbers.

Q. $3\sqrt{81} =$

A. $3\sqrt{81} =$
 $= 3 \times \sqrt{9 \times 9}$
 $= 3 \times 9$
 $= 27$

a) $2\sqrt{64} =$

$= 2 \times \sqrt{8 \times 8}$

$= 2 \times 8 = \boxed{}$

b) $4\sqrt{9} =$

$=$
 $= = \boxed{}$

c) $3\sqrt{16} =$

$=$
 $= = \boxed{}$

d) $2\sqrt{49} =$

$=$
 $= = \boxed{}$

e) $4\sqrt{25} =$

$=$
 $= = \boxed{}$

f) $2\sqrt{144} =$

$=$
 $= = \boxed{}$

g) $6\sqrt{100} =$

$=$
 $= = \boxed{}$

h) $7\sqrt{36} =$

$=$
 $= = \boxed{}$

i) $4\sqrt{64} =$

$=$
 $= = \boxed{}$

j) $2\sqrt{169} =$

$=$
 $= = \boxed{}$

k) $2\sqrt{900} =$

$=$
 $= = \boxed{}$

l) $5\sqrt{121} =$

$=$
 $= = \boxed{}$

m) $4\sqrt{225} =$

$=$
 $= = \boxed{}$

n) $2\sqrt{625} =$

$=$
 $= = \boxed{}$

o) $5\sqrt{1600} =$

$=$
 $= = \boxed{}$

p) $3\sqrt{400} =$

$=$
 $= = \boxed{}$

q) $6\sqrt{2500} =$

$=$
 $= = \boxed{}$

r) $10\sqrt{0.25} =$

$=$
 $= = \boxed{}$

Skill 12.5 Multiplying square roots of perfect squares.

MM5.2 11 22 33 44
MM10 11 22 33 44

- Find the square roots. (see skill 12.1, page 123)
- Multiply the whole numbers.

$$\sqrt{9} \times \sqrt{9} = \sqrt{9 \times 9} = 9$$

The square root of any number multiplied by itself equals the number

Q. $2\sqrt{49} \times \sqrt{49} =$

A. $2\sqrt{49} \times \sqrt{49} =$
 $= 2 \times 49$
 $= 98$

a) $\sqrt{36} \times \sqrt{36} =$

b) $\sqrt{7} \times \sqrt{7} =$

c) $\sqrt{25} \times \sqrt{25} =$

d) $\sqrt{81} \times \sqrt{25} =$
 $= 9 \times 5 =$

e) $\sqrt{16} \times \sqrt{9} =$
 $= \dots =$

f) $\sqrt{49} \times \sqrt{64} =$
 $= \dots =$

g) $\sqrt{121} \times 3\sqrt{9} =$
 $= \dots =$

h) $3\sqrt{16} \times \sqrt{100} =$
 $= \dots =$

i) $\sqrt{36} \times 4\sqrt{25} =$
 $= \dots =$

j) $\sqrt{9} \times 2\sqrt{49} =$
 $= \dots =$

k) $\sqrt{144} \times 4\sqrt{4} =$
 $= \dots =$

l) $2\sqrt{36} \times \sqrt{25} =$
 $= \dots =$

m) $2\sqrt{25} \times \sqrt{64} =$
 $= \dots =$

n) $\sqrt{169} \times 2\sqrt{9} =$
 $= \dots =$

o) $2\sqrt{4} \times 3\sqrt{121} =$
 $= \dots =$

p) $4\sqrt{9} \times 2\sqrt{100} =$
 $= \dots =$

q) $3\sqrt{64} \times 2\sqrt{49} =$
 $= \dots =$

r) $5\sqrt{36} \times 2\sqrt{144} =$
 $= \dots =$

Skill 12.6 Dividing square roots of perfect squares.

MM5.2 11 22 3 4
MM10 11 22 3 4 4

- Find the square roots.
(see skill 12.1, page 123)
- Divide the whole numbers.

The square root of any number divided by itself equals 1

$$\frac{\sqrt{9}}{\sqrt{9}} = \sqrt{9} \div \sqrt{9} = 1$$

Q. $\frac{\sqrt{81}}{\sqrt{9}} =$

A. $\frac{\sqrt{81}}{\sqrt{9}} =$
 $= \frac{9}{3}$
 $= 3$

Find the square root of the numerator and the denominator

a) $\sqrt{64} \div \sqrt{16} =$

$= 8 \div 4 = \boxed{2}$

b) $\sqrt{100} \div \sqrt{25} =$

$= \dots = \boxed{}$

c) $\sqrt{36} \div \sqrt{9} =$

$= \dots = \boxed{}$

d) $\sqrt{900} \div \sqrt{36} =$

$= \dots = \boxed{}$

e) $\sqrt{144} \div \sqrt{4} =$

$= \dots = \boxed{}$

f) $\sqrt{196} \div \sqrt{49} =$

$= \dots = \boxed{}$

g) $\frac{\sqrt{400}}{\sqrt{16}} =$

$= \dots = \boxed{}$

h) $\frac{\sqrt{144}}{\sqrt{9}} =$

$= \dots = \boxed{}$

i) $\frac{\sqrt{900}}{\sqrt{25}} =$

$= \dots = \boxed{}$

j) $8\sqrt{4} \div 2\sqrt{4} =$

$= (8 \times 2) \div (2 \times 2)$
 $= 16 \div 4 = \boxed{}$

k) $4\sqrt{100} \div 2\sqrt{25} =$

$= \dots = \boxed{}$

l) $4\sqrt{900} \div 2\sqrt{9} =$

$= \dots = \boxed{}$

m) $\frac{4\sqrt{9}}{\sqrt{9}} =$

$= \dots = \boxed{}$

n) $\frac{2\sqrt{400}}{\sqrt{4}} =$

$= \dots = \boxed{}$

o) $\frac{3\sqrt{25}}{\sqrt{9}} =$

$= \dots = \boxed{}$

p) $\frac{2\sqrt{100}}{\sqrt{25}} =$

$= \dots = \boxed{}$

q) $\frac{5\sqrt{64}}{\sqrt{16}} =$

$= \dots = \boxed{}$

r) $\frac{4\sqrt{36}}{2\sqrt{4}} =$

$= \dots = \boxed{}$

Skill 12.7 Adding and subtracting square roots of perfect squares.

MM5.2 11 22 33 44
MM10 11 22 33 44

- Find the square roots. (see skill 12.1, page 123)
- Add or subtract the whole numbers.

Hint: Square roots that are not alike cannot be added or subtracted.

$$\sqrt{16} + \sqrt{4} \neq \sqrt{16 + 4}$$

$$4 + 2 \neq \sqrt{20}$$

$$\sqrt{16} - \sqrt{4} \neq \sqrt{16 - 4}$$

$$4 - 2 \neq \sqrt{12}$$

Q. $\sqrt{25} + \sqrt{25} + \sqrt{25} + \sqrt{25} = \sqrt{100}$
True or false?

A. $\sqrt{25} + \sqrt{25} + \sqrt{25} + \sqrt{25} = \sqrt{100}$
 $5 + 5 + 5 + 5 = 10$
 $20 = 10$
False

a) $\sqrt{64} - \sqrt{9} =$

$= 8 - 3$

$=$

b) $\sqrt{100} + \sqrt{36} =$

$=$

c) $\sqrt{25} + \sqrt{49} =$

$=$

d) $\sqrt{196} - \sqrt{49} =$

$=$

e) $\sqrt{144} - \sqrt{64} =$

$=$

f) $\sqrt{81} + \sqrt{121} =$

$=$

g) $\sqrt{9} + \sqrt{16} =$

$=$

h) $\sqrt{36} + \sqrt{64} =$

$=$

i) $\sqrt{49} - \sqrt{25} =$

$=$

j) $\sqrt{25} + \sqrt{100} =$

$=$

k) $\sqrt{144} + \sqrt{49} =$

$=$

l) $\sqrt{144} + \sqrt{256} =$

$=$

m) $\sqrt{400} - \sqrt{81} =$

$=$

n) $\sqrt{121} - \sqrt{100} =$

$=$

o) $\sqrt{169} - \sqrt{144} =$

$=$

p) $\sqrt{169} - \sqrt{25} = \sqrt{144}$
True or false?

$\dots\dots\dots$

q) $\sqrt{4} + \sqrt{4} = \sqrt{9}$
True or false?

$\dots\dots\dots$

r) $\sqrt{64} + \sqrt{36} = \sqrt{100}$
True or false?

$\dots\dots\dots$

s) $\sqrt{64} - \sqrt{25} = \sqrt{9}$
True or false?

$\dots\dots\dots$

t) $\sqrt{100} - \sqrt{36} = \sqrt{64}$
True or false?

$\dots\dots\dots$

u) $\sqrt{9} + \sqrt{9} + \sqrt{9} + \sqrt{9} = \sqrt{36}$
True or false?

$\dots\dots\dots$

- Find the perfect squares greater than ($>$) and less than ($<$) the number.

Q. Between which two consecutive whole numbers does $\sqrt{8}$ lie?

A. $4 < 8 < 9$

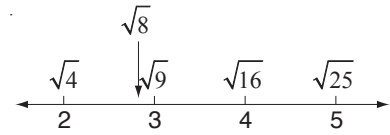
$$\sqrt{4} < \sqrt{8} < \sqrt{9}$$

$$\sqrt{4} = 2$$

$$\sqrt{9} = 3$$

$$2 < \sqrt{8} < 3$$

The answer is 2 & 3



a) Between which two consecutive whole numbers does $\sqrt{72}$ lie?

$$\sqrt{64} = 8 \quad \sqrt{81} = 9$$

8 & 9

b) Between which two consecutive whole numbers does $\sqrt{10}$ lie?

&

c) Between which two consecutive whole numbers does $\sqrt{5}$ lie?

&

d) Between which two consecutive whole numbers does $\sqrt{60}$ lie?

&

e) Between which two consecutive whole numbers does $\sqrt{34}$ lie?

&

f) Between which two consecutive whole numbers does $\sqrt{24}$ lie?

&

g) Between which two consecutive whole numbers does $\sqrt{80}$ lie?

&

h) Between which two consecutive whole numbers does $\sqrt{145}$ lie?

&

i) Between which two consecutive whole numbers does $\sqrt{56}$ lie?

&

j) Between which two consecutive whole numbers does $\sqrt{150}$ lie?

&

k) Between which two consecutive whole numbers does $\sqrt{99}$ lie?

&

l) Between which two consecutive whole numbers does $\sqrt{138}$ lie?

&