

Student Name

Mathematics Stage 4

COMPUTATION WITH INTEGERS

Book 4 Apply the 4 operations to integers

Version: 260207

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OVERVIEW

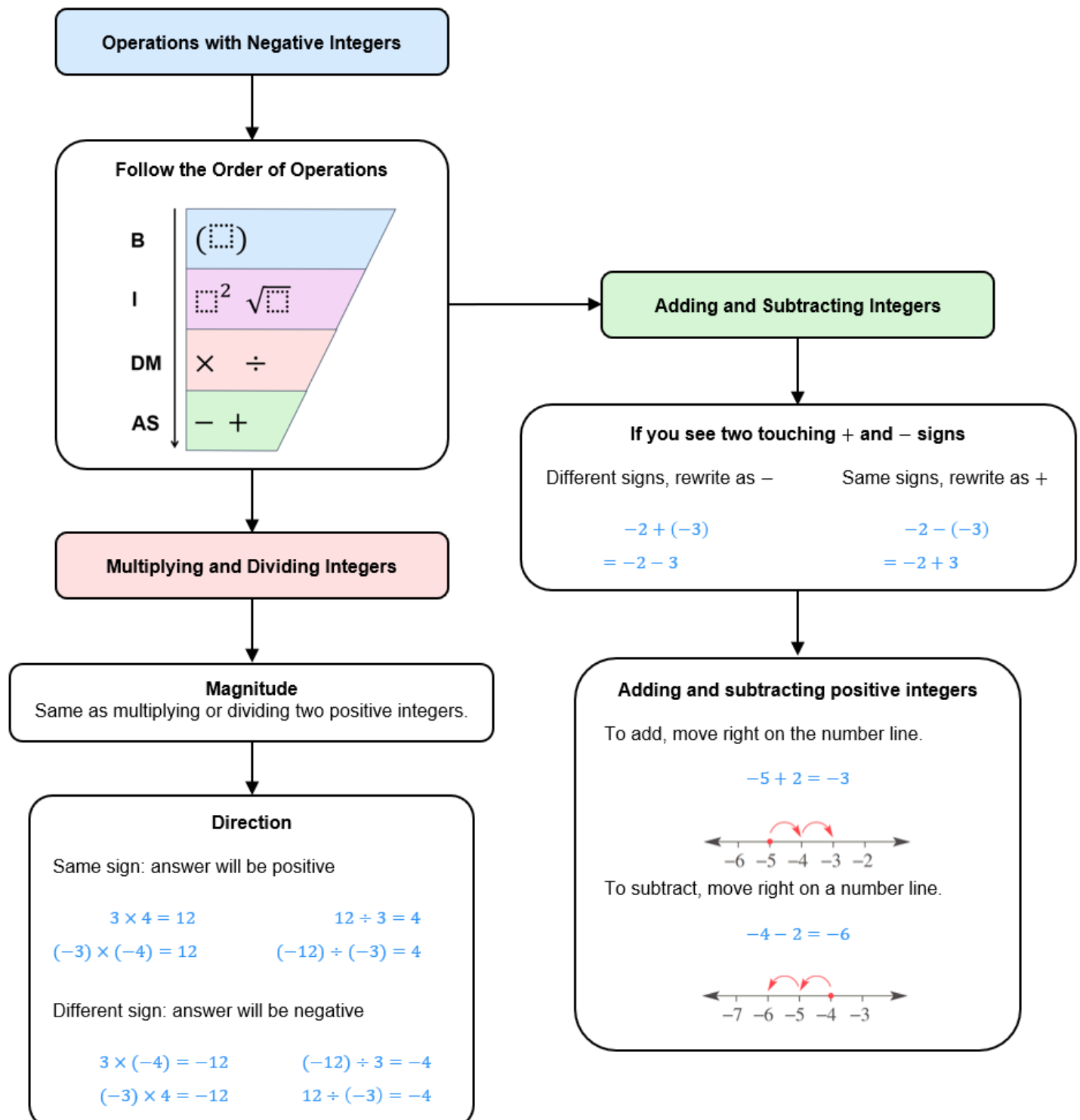
SYLLABUS CONTENT

MA4-INT-C-01 compares, orders and calculates with integers to solve problems

Apply the 4 operations to integers

- Apply the 4 operations to integers
- Solve problems involving grouping symbols with integers
- Apply the order of operations to evaluate expressions involving integers, with and without the use of digital tools

SUMMARY



REVIEW OF PRIOR KNOWLEDGE

1 Complete each calculation mentally.

a $2 + 3 \times 7$

b $10 - 20 \div 2$

c $22 - 16 \div 4$

d $3 \times 8 - 2 \times 3$

e $18 \div 9 + 60 \div 3$

f $40 - 25 \div 5 + 3$

g $18 \div (10 - 4)$

h $(100 + 5) \div 5 + 1$

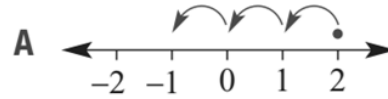
i $14 - (7 \div 7 + 1) \times 2$

APPLY THE FOUR OPERATIONS TO INTEGERS

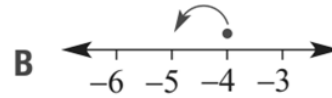
FOUNDATION

1 Match up the problems (a to d) with the number lines (A to D).

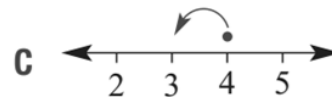
a $4 + (-1)$



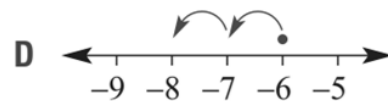
b $2 + (-3)$



c $-6 + (-2)$



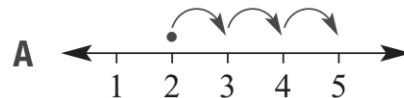
d $-4 + (-1)$



a - C, b - A, c - D, d - B

2 Match each subtraction (a to d) with the correct diagram (A to D)

a $5 - (-1)$



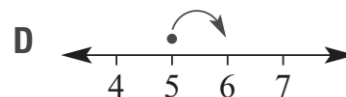
b $2 - (-3)$



c $-4 - (-2)$



d $-1 - (-1)$



a - D, b - A, c - B, d - C

3 Answer these questions.

a $5 + 3$

b $3 + 5$

c $-3 + 5$

d $5 + (-3)$

e $-5 + (-3)$

f $-5 + 3$

g $-5 - 3$

h $-3 - 5$

i $3 - 5$

j $3 - (-5)$

k $-3 - (-5)$

4 Answer these questions

a $-21 \div (-3)$ 7	b $-45 \div 9$ -5	c $5 \times (-4)$ -20	d $8 \times (-5)$ -40
e $-10 \div (-2)$ 5	f $-15 \div 5$ -3	g $18 \div (-3)$ -6	h $14 \div (-7)$ -2
i -10×4 -40	j $3 \times (-6)$ -18	k 8×4 32	l $(-7) \times 0$ 0

5 Answer these questions.

a $-4 + 6$ 2	b $-5 + 8$ 3	c $-1 + 3$ 2	d $-4 + 7$ 3
e $2 + (-3)$ -1	f $-1 + (-4)$ -5	g $-2 + (-3)$ -5	h $-1 + (-4)$ -5
i $-2 + (-3)$ -5	j $-6 + 6$ 0	k $-7 + 4$ -3	l $-6 + 2$ -4
m $-7 + 2$ -5	n $-5 + (-5)$ -10	o $5 + (-5)$ 0	p $-7 + 7$ 0
q $5 + (-4)$ 1	r $6 + (-7)$ -1	s $-7 + 8$ 1	t $-3 + 2$ -1
u $-5 + 7$ 2	v $-5 + 3$ -2	w $-5 + 3$ -2	x $6 + (-4)$ 2

6 Write a different calculation for the following and evaluate the result.

a $28 + (-78)$ -50	b $-28 + (-76)$ -104	c $76 + (-28)$ 48	d $18 + (-76)$ -58
e $-18 + (-76)$ -94	f $76 + (-18)$ 58	g $-76 + (-18)$ -94	h $-77 + (-19)$ -96

7 Find the missing number.

a $-5 \times \square = -35$

b $\square \div (-4) = 2$

c $-10 \times \square = 80$

d $15 \times \square = -30$

e $34 \div \square = -34$

f $-6 \times \square = -36$

g $-15 \times \square = 45$

h $15 \div \square \div 3 = -1$

i $\square \div 9 \times (-3) = 3$

8 Find the missing number.

a $17 + \square = 23$

b $17 + \square = -23$

c $-17 + \square = -23$

d $-17 + \square = 23$

e $\square + 24 = 18$

f $\square + 24 = -18$

g $\square - 24 = 18$

h $\square - 24 = -18$

9 Calculate the answer without a number line.

a $(-20) + 18$

b $(-39) + 41$

c $39 - 51$

d $21 - 26$

e $(-18) + 19$

f $100 - 200$

g $(-95) + 350$

h $(-49) - 130$

i $(-210) - 120$

j $62 - 84$

k $-21 - 26$

l $(-99) + 68$

l $(-3125) - 2125$

m $(-4000) + 4000$

n $(-5500) + 6700$

10 Find the missing number.

a $\square + 6 = 8$

b $-6 + \square = 5$

c $12 - \square = 15$

d $-9 + \square = -10$

e $13 - \square = 20$

f $10 - \square = -1$

g $5 - \square = 6$

h $2 - \square = 7$

i $-1 - \square = 3$

j $\square - (-3) = 7$

k $\square - (-10) = 12$

l $\square - (-4) = -20$

m $5 - \square = 11$

n $\square - (-2) = -3$

o $-2 - \square = -4$

p $\square - (-5) = -1$

q $6 - \square = 15$

r $\square - (-2) = -4$

s $2 + \square = -1$

t $3 + \square = -7$

u $-2 + \square = -6$

v $\square + (-3) = 1$

w $\square + (-10) = -11$

x $\square + (-4) = 0$

y $\square + (-3) = 2$

z $\square + (-6) = -1$

aa $-2 + \square = -3$

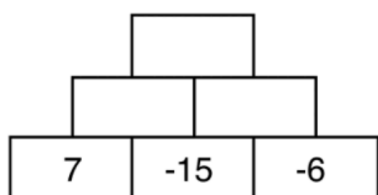
bb $5 \times \square = -2 \times 15$

cc $-3 \times \square = -24 - 3$

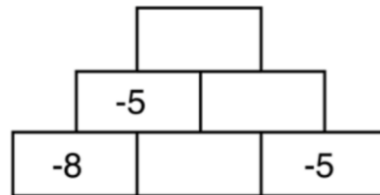
dd $-2 \times \square \times 6 = -40 + 4$

11 Complete the pyramid. Each rectangle is the sum of the two rectangles directly below.

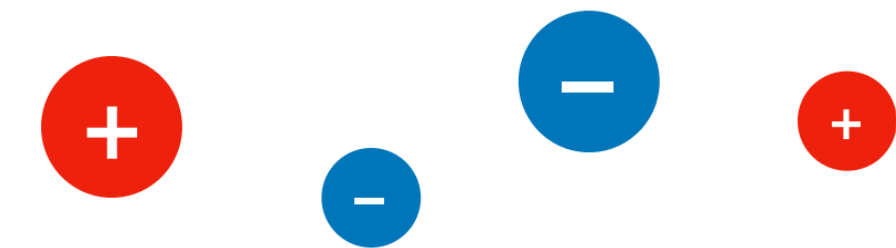
a



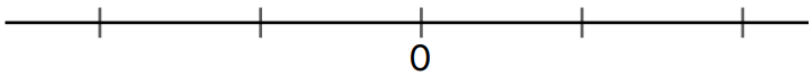
b



12 Some numbers are represented by counters. The larger the counter, the larger the magnitude. Same size counters have the same magnitude.



Use the number line to show the possible positions of the numbers.



State whether the results of these calculations have a positive, negative, or zero answer.

(a)  + 	(b)  + 	(c)  - 	(d)  - 
p	p	p	n
(e)  + 	(f)  + 	(g)  + 	(h)  + 
0	n	p	n
(i)  - 	(j)  - 	(k)  - 	(l)  - 
0	p	0	n
(m)  + 	(n)  - 	(o)  + 	(p)  - 
0	0	0	p

- 13** Create an example of an addition that belongs in each box.
Some boxes are not possible to fill in – decide which ones.

	Sum is positive	Sum is zero	Sum is negative
Positive + Positive		Not possible :(	Not possible :(
Negative + Positive			
Positive + Negative			
Negative + Negative	Not possible :(	Not possible :(	

- 14** Create an example of a subtraction that belongs in each box.
Some boxes are not possible to fill in – decide which ones.

	Difference is positive	Difference is zero	Difference is negative
Positive – Positive			
Negative – Positive	Not possible :(	Not possible :(	
Positive – Negative		Not possible :(	Not possible :(
Negative – Negative			

- 15** Complete the tables.

+	-3	5		
	-7			0
			0	6
-8	-11	-3		
7				

-3 5 -2 4
-4 -7 1 -6 0
2 -1 7 0 6
-8 -11 -3 -10 -4
7 4 12 5 11

b

+				-9
-7	-12			
	8	11		
		-13	-8	
8				-1

-5 -2 3 -9
-7 -12 -9 -4 -16
13 8 11 16 4
-11 -16 -13 -8 -20
8 3 6 11 -1

16 Write a multiplication or division symbol to make a true statement.

a 2 (-3) (-6) = 1	b -25 (-5) 3 = 15
× ÷	÷ ×
c -36 2 (-3) = 216	d -19 (-19) 15 = 15
× ×	÷ ×

17 [UKMT JMC 2010]

What is $2010 + (+2010) + (-2010) - (+2010) - (-2010)$?

.....

2010

18 If $-50 - 70 = -120$, then what is:

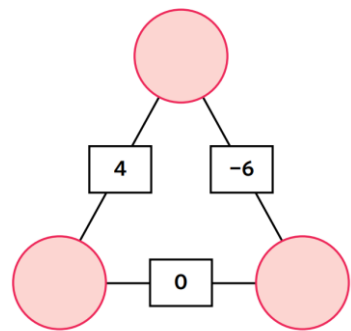
a -51 - 69	b -51 - 71	c -71 - 51	d -73 - 49
-120	-122	-122	-122

19 Find the next three numbers in these sequences.

a 3 -9 27 	-81 243 - 729
b -32 16 -8 	4 - 2 1
c 600 -480 384 	-307.2 245.76 - 196.608

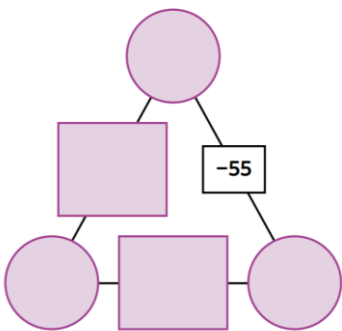
20 The rectangular boxes represent the number halfway between the two connecting circles.

a Use the numbers -10, -2, 10 to complete the puzzle.



-2
10 - 10

b Use -100, -75, -50, -30, -10 to complete the puzzle.

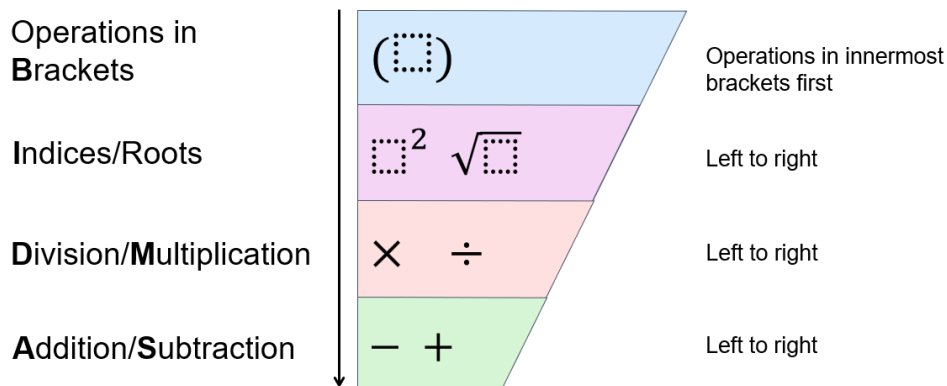


-10
-30
-50 - 75 - 100

ORDER OF OPERATIONS WITH INTEGERS

- Applying the order of operations with integers requires you to distinguish whether the minus symbols " − " are operations or negative signs.

Write a new line for every operation you do



Example Order of operations with negative integers.

$4 + 2 \times (-3)$ $= 4 + (-6)$ $= -2$	Which operation was done first? <i>We before we add.</i> How did we know $4 + (-6) = -2$? <i>This is the same as, which makes -2</i>
$(30 + 5) - 10 \div (-2)$ $= 35 - 10 \div (-2)$ $= 35 - (-5)$ $= 40$	Which operation was done first and why? <i>We did $30 + 5$ first because it was inside</i> Which operation was done second?

Evaluate:

a $6 + 3 \times (-2)$

$= 6 + \dots\dots\dots$

$= \dots\dots\dots$

b $1 - 48 \div 12$

$= 1 - \dots\dots\dots$

$= \dots\dots\dots$

c $10 \times 3 + 3 \times (-1)$

d $8 \times 9 - 15 \div (-3)$

e $(3 + 2) \times (-2)$

f $-3 \times (-2 + 4)$

1 Which operation is done first in each of the following computations?
Do not evaluate the answer yet.

a $-2 \div 2 + 1$ $-2 \div 2$	b $8 \times (-6) - 4$ $8 \times (-6)$	c $-3 + 2 \times (-6)$ $2 \times (-6)$
d $7 - (-8) \div 4$ $(-8) \div 4$	e $(-2 + 3) \div 5$ $(-2 + 3)$	f $-6 \div (4 - (-2))$ $4 - (-2)$
g $-4 \times 3 \div (-6)$ -4×3	h $(2 + 3 \times (-2)) + 1$ $3 \times (-2)$	i $-11 \div (7 - 2 \times (-2))$ $2 \times (-2)$

2 Use the counters to work out $3 + 4 \times (-2)$

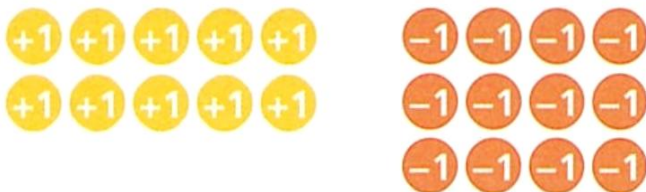


-5

3 Underline the part of each calculation that you need to work out first.
Then work out the answers.

a $5 + 10 \times (-2)$ -15	g $1 + 8 \times 3 - 4$ 21	m $(2 + 5) \times 6 + 2$ 44
b $5 - 10 \times (-2)$ 25	h $1 - 8 \times 3 - 4$ -27	n $(-2 + 5) \times (-6) + 3$ -15
c $-6 - 3 \times 5$ -21	i $11 + 10 \div (-2)$ 6	o $11 \times (2 - 10)$ -88
d $6 - 3 \times 5$ -9	j $11 - 10 \div (-2)$ 16	p $-11 \times (2 - 10)$ 88
e $7 \times (3 - 5)$ -14	k $4 - 10 \div 5$ 2	
f $-7 \times (3 - 5)$ 14	l $4 - 10 \div (-5)$ 6	

4 Use the counters to work out $2 \times 5 + 3 \times (-4)$



-2

5 Underline all the operations that have equal priority, then calculate the answer.

a $4 \times (-2) + 3 \times 5$	d $(2 - 10) \div (9 - 7)$	g $3 + 4 \times (-6) \div 2$
7	-4	-9
b $4 \times (-2) + 3 \times (-5)$	e $(2 - 10) \div (7 - 9)$	h $3 - 4 \times (-6) \div 2$
-23	4	15
c $4 \times (-2) - 3 \times 5$	f $3 - 4 \times (-6) \div 2$	i $3 + 4 \times (-6) \div (-2)$
-23	-10	15

6 Use order of operations to calculate the answer to the following. Show each step of working out. Check your answer using a calculator.

a $2 + 3 \times (-3)$	b $9 + 10 \div (-5)$	c $20 + (-4) \div 4$
-7	7	19
d $18 + (-9) \times 1$	e $10 - 2 \times (-3)$	f $10 - 1 \times (-4)$
9	16	14
g $-8 - (-7) \times 2$	h $-2 \times 4 + 8 \times (-3)$	i $12 \div (-6) + 4 \div (-2)$
6	-32	-4
j $-30 \div 5 - 6 \times 2$	k $-2 \times 3 - 4 \div (-2)$	l $8 \times (-2) - (-3) \times 2$
-18	-4	-10

- 7** Use order of operations to calculate the answer to the following. Show full working out.
Check your answer using a calculator.

a $(3 + 2) \times (-2)$

b $-3 \times (-2 + 4)$

c $-1 \times (7 - 8)$

d $(8 - 4) \div (-2)$

e $10 \div (4 - (-1))$

f $(24 - 12) \div (16 + (-4))$

g $-2 \times (8 - 4) + (-6)$

h $-2 - 3 \times (-1 + 7)$

i $1 - 2 \times (-3) \div (-3 - (-2))$

j $(-3 + (-5)) \times (-2 - (-1))$

k $-3 \div (-1 + 4) \times 6$

l $-5 - (8 + (-2)) + 9 \div (-9)$

- 8** A debt of \$550 is doubled and then \$350 of debt is removed each month for 3 months.
What is the final balance?

.....
.....
.....

-50

- 9 Use order of operations to evaluate the following. Remember that there are invisible brackets enclosing the numerator and denominator of a fraction. Check your answer using a calculator.

a $\frac{8-4}{-2}$

-2

b $\frac{10}{4-(-1)}$

2

c $\frac{24-12}{16+(-4)}$

1

d $1 - \frac{2 \times (-3)}{-3 - (-2)}$

-5

e $\frac{3}{1+4} \times 6$

$\frac{18}{5}$

f $\frac{-(-2) - 2 \times (-5)}{-3}$

-4

g $\frac{2 \times (-2) - 5 \times (-5)}{-3}$

-7

h $\left(\frac{-4 + (-4)}{4 - (-4)} \right)^2$

1

- 10 Work out the missing numbers in these calculations.

a i $\square \times 5 + 1 = 31$

6

ii $\square \times 5 + 1 = -9$

-2

b i $6 + \square \times 3 = 12$

2

ii $6 + \square \times 3 = 0$

-2

iii $6 + \square \times 3 = -12$

-6

c i $9 - \square + 3 = 5$

7

ii $9 - \square + 3 = 10$

2

iii $9 - \square + 3 = 20$

-8

- 11 Classify each of the following statements as true or false.

a $-4 + 2 \times 3 = -4 + (2 \times 3)$

T

b $-4 + 2 \times 3 = (-4 + 2) \times 3$

F

c $8 \times (2 - (-2)) = 8 \times 4$

T

d $8 \times (2 - (-2)) = 8 \times 0$

F

e $-40 - 20 \div (-5) = (-40 - 20) \div (-5)$

F

f $-40 - 20 \div (-5) = -40 - (20 \div (-5))$

T

12 Use the given numbers to make a true equation.

a $\square \times (\square + \square) = 28$
use $-7, -6$ and 2

$-7 - 6 \ 2$

b $\square \times (\square + \square) = -15$
use $-5, -3$ and 6

$-5 \ 6 \ -3$

c $\square \times (\square + \square) = -40$
use $10, -5$ and -2

$-5 \ 10 \ -2$

d $\square \times (\square - \square) = -70$
use $-6, 8$ and -5

$-5 \ 8 \ -6$

e $\square \times (\square - \square) = 24$
use $-8, -2$ and -4

$-4 \ -8 \ -2$

f $\square \times (\square - \square) = -63$
use $-6, -7$ and 3

$-7 \ 3 \ -6$

13 Insert brackets into the calculations to make the answer correct.

a i $4 \times 2 - 9 + 1 = -2$

ii $4 \times 2 - 9 + 1 = -27$

a i: $(9+1)$ ii: $(2-9)$

b i $3 \times 5 - 3 - 10 = -4$

ii $3 \times 5 - 3 - 10 = 22$

b i: $(5-3)$ ii: $(3-10)$

14 Evaluate the following:

a $-21 + 2 \times 6 - 3$

b $\frac{-135}{(75-30)}$

c $(-5)^2 \times 6 \div [10 \times 5 \div (-10)]$

-12

-3

-30

d $(-4 + 7) \times (16 - 9)$

e $(7 - 10)^3 + 21 \div -7$

f $120 - 20 \times 5 - 40 \div 2 \div 5$

21

-30

16

g $234 \div [103 - (72 - 86)]$

h $\frac{25 \times 2 - (-5)}{11}$

i $\{[79 - (2 - 3)] \div 4\} - 1 \times (-7 - 3)$

2

5

30

15 Insert brackets to make each statement true.

- a

$-10 \div 4 + 1 = -2$
- b

$-5 - 1 \div (-6) = 1$

$(4 + 1)$
- c

$50 \times 7 - 8 \times (-1) = 50$

$(-5 - 1)$
- d

$-3 + 9 \div (-7) + 5 = -3$

$(7 - 8)$
- e

$32 - (-8) \div (-3) + 7 = 10$

$(-3 + 9) ((-7) + 5)$
- $(32 - (-8)) ((-3) + 7)$

16 Given that $5^3 = 5 \times 5 \times 5$, is the answer to each of the following positive or negative?
(you do not need to do any calculations!)

- a

$-6 \times (-4) \times (-8) \times (-108) \times (-96)$

Negative
- b

$100 \div (-2) \div 2 \div (-5)$

positive
- c

$(-3)^3$

Negative
- d

$-1 \times (-2)^4$

negative

17 Here are some digit and operation cards.

-2

3

4

8

-9

+

-

$\times$

$\div$

Choose any 3 digits and 2 operations to go into these boxes. You can only use each card once.

What answer do you get?

Depends on the cards you chose.

Find two ways to make the answer zero.

$-2 \times 4 + 8$

$8 \div 4 + -2$

Other answers are possible.

18 Show that the answer to $6 \times 11 - 3 \times (6 - 2) - 2 \times (11 - 3) - 2 \times 3$ is 32.

19 Evaluate the following.

a $(-2)^3 - (-2)^2$

b $\frac{(4-12) \times (-3--7)}{4}$

c $-20 \div [-2 \times 4 - 3 \times -6]$

d $\frac{-7+3}{-11--7}$

e $(-3 - -7)^2 \times 3$

f $(-1)^{100}$

g $(-2 \times 3)^3 - (-3 - -2)^3$

h $(-4 - -6)^{(-2--3)} - \frac{3--7}{5+(-10)}$

20 [UKMT JMO 2013]

What is the value of $((1 - 1) - 1) - (1 - (1 - 1))$?

21 [UKMT JMO 2007]

What is the value of $1^5 - 2^4 + 3^3 - 4^2 + 5^1$

22 Ed thinks of a number. He takes away four lots of this number from itself. He is left with -36 . What was Ed's original number?

CHECK YOUR UNDERSTANDING

Order of operations with integers

1 $3 - 4 \times 2$

a 2

b -2

c 5

d -5

2 $1 + (-2) \times 5 + 3$

a -6

b -8

c -2

d -12

3 $10 \div 5 + (-3) \times 10$

a -10

b -28

c 28

d 32

4 Which of these is equal to -20?

a $2 \times (-2) - (-4) \times 4$

b $-28 - (-4) \times 2$

c $(-5)^2 + 5$

d $(-42) \div (-2) + 1$

5 Which of these is equal to -20?

a $(-3)^2 - 11$

b $3 \times (-4) - (-4) \times 2$

c $-28 - (-4) \times (-2)$

d $(-33) \div (-3) - 31$