Practice Test

1. Write as a product or quotient of powers.

a) $(3 \times 4)^3$ **b)** $[(-5) \times 2]^4$ **c)** $\left(\frac{1}{4}\right)^4$ **d)** $-\left(\frac{9}{3}\right)^3$

2. Simplify.

a) $-(2^3)^3$ **b)** $(6^2)^0$ **c)** $[(-5)^2]^3$ **d)** $-[(-3)^2]^4$

3. Simplify each expression, then evaluate it.

a) $[(-3) \times (-2)]^4$ **b)** $\left(\frac{1}{2}\right)^5$ **c)** $(6^0)^4$ **d)** $[(-3)^2]^3$

4. Is the value of a power with a negative base always negative?
Or, is it always positive? Or, is it sometimes negative and sometimes positive?
Illustrate your answer with some examples.

5. A baseball diamond is a square with side length about 27 m.
Is the area of the baseball diamond greater or less than 10^3 m^2?
How do you know?

6. Explain why the brackets are not necessary in this expression:
$(-3^5 \times 10) - (9 \div 3)$
Evaluate the expression, showing each step.

7. Identify the correct answer for $(2^3 + 4)^2 \times (-10)^3 \div (5 + 5)^2$.

a) -240 **b)** -1440 **c)** 1440 **d)** $-28\,825$

Explain how each of the other incorrect answers could have been determined.

8. Evaluate only the expressions with a positive value. Explain how you know the sign of each expression before you evaluate it.

a) $(-5)^3 \times (-5)^2 \div (-5)^1$ **b)** $[(-9)^6 - (-9)^3]^0$

c) $\dfrac{(-1)^2 \times (-1)^4}{(-1)^3 \times (-1)^2}$ **d)** $(-4)^6 + (-4)^4 \times (-4)^0$

11. a) The tallest tree in the world, Hyperion in California, is about 10^2 m tall. The highest mountain, Mount Everest, is about 10^4 m high. About how many times as high as the tree is the mountain?

b) Earth's diameter is about 10^7 m. The largest known star has a diameter of about 10^{12} m. About how many times as great as the diameter of Earth is the diameter of the largest known star?

12. Write each number in standard form.

a) $(4 \times 10^3) + (7 \times 10^2) + (2 \times 10^1) + (9 \times 10^0)$

b) $(3 \times 10^5) + (2 \times 10^2) + (8 \times 10^0)$

2.3

13. Evaluate.

a) $3^4 + 3^2$ b) $(-4)^2 + (-4)^3$

c) $10^3 - 10^2$ d) $(-5)^4 - (-5)^2$

14. Evaluate.

a) $2^3 + (5 - 2)^4$

b) $100 \div 2 + (4 + 1)^3$

c) $(6^2 + 7^2)^0 - (8^4 + 2^4)^0$

d) $3 \times 2^3 + 8 \div 4$

e) $(21 \div 7)^4 - 2^3$

f) $[(-4)^0 \times 10]^6 \div (15 - 10)^2$

15. Scientists grow bacteria.
This table shows how the number of bacteria doubles every hour.

Time	Elapsed Time After Noon (h)	Number of Bacteria
noon	0	1000×2^0
1:00 P.M.	1	1000×2^1
2:00 P.M.	2	1000×2^2
3:00 P.M.	3	1000×2^3

a) Evaluate the expressions in the table to find the number of bacteria at each time.
i) noon ii) 1:00 P.M.
iii) 2:00 P.M. iv) 3:00 P.M.

b) The pattern continues. Write an expression, then evaluate it, to find the number of bacteria at each time.
i) 4:00 P.M. ii) 6:00 P.M.
iii) 9:00 P.M. iv) midnight

16. Use a calculator to evaluate this expression:
$4^3 - (2 \times 3)^4 + 11$
Change the position of the brackets.
Evaluate the new expression. How many different answers can you get by changing only the position of the brackets?

17. Identify, then correct, any errors in the student work below. Explain how you think the errors occurred.

$(-2)^2 \times 2^3 - 3^2 \div (-3) + (-4)^2$
$= (-2)^5 - 9 \div (-3) + 16$
$= -32 - 3 + 16$
$= -35 + 16$
$= -19$

2.4

18. Write each product as a power, then evaluate the power.

a) $5^3 \times 5^4$ b) $(-2)^3 \times (-2)^2$

c) $3^2 \times 3^3 \times 3^1$ d) $-10^4 \times 10^0$

19. There are about 10^{11} galaxies in the universe. Each galaxy contains about 10^{11} stars. About how many stars are in the universe?

20. Write each quotient as a power, then evaluate the power.

a) $7^5 \div 7^3$ b) $(-10)^9 \div (-10)^3$

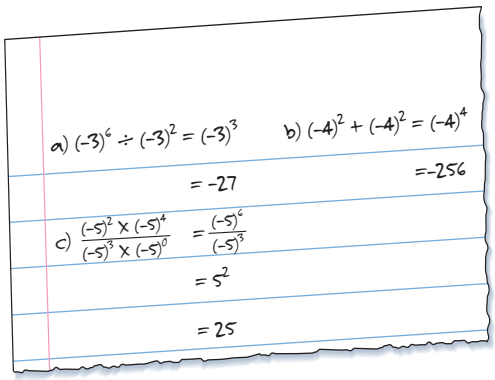
c) $\frac{8^4}{8^2}$ d) $-\frac{6^7}{6^4}$

21. a) Can you use the laws of exponents to simplify $6^3 \times 5^5$? Explain.

b) Can you use the laws of exponents to simplify $27^2 \div 9^2$? Explain.

22. Find and correct any errors in the student work below.

Explain how you think the errors occurred.



2.5

23. Write each expression as a product or quotient of powers, then evaluate it.

a) $(3 \times 5)^3$ b) $(12 \div 3)^5$

c) $[(-4) \times 2]^4$ d) $(63 \times 44)^0$

e) $\left(\frac{3}{2}\right)^5$ f) $\left(\frac{15}{2}\right)^2$

24. Write each expression as a power.

a) $(3^2)^3$ b) $(4^0)^6$

c) $[(-2)^3]^3$ d) $(5^5)^2$

25. For each expression below:

Evaluate it in two different ways:

i) do the operation in brackets first

ii) use the exponent laws

In each case, which method is more efficient? Explain why.

a) $(5 \times 3)^3$

b) $(3 \times 3)^4$

c) $(8 \div 2)^5$

d) $\left(\frac{9}{3}\right)^2$

e) $(2^3)^4$

f) $(6^2)^0$

26. Write each expression as a power, then evaluate.

a) $6^4 \times 6^3$

b) $(-11)^7 \div (-11)^5$

c) $\frac{3^4 \times 3^5}{3^3}$

d) $\frac{5^5}{5^3 \times 5^2}$

e) $\frac{(-4)^3 \times (-4)^6}{(-4)^2 \times (-4)^4}$

f) $\frac{10^6 \times 10^0}{10^3 \times 10^2}$

27. Simplify, then evaluate each expression.

a) $2^3 \times 2^2 - 2^0 + 2^4 \div 2^3$

b) $\frac{(-2)^3 \times (-2)^2}{(-2)^3 - (-2)^2}$

c) $12^2 \times 12^4 \div (-2)^4 - 12^0$

d) $\frac{(-12)^2 \times (-12)^4}{(-2)^4 - 12^0}$